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REMEDIAL INVESTIGATION
BADGER ARMY AM (TITTION PLANT
BARABOO, VIS ONSIN

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FINAL REMEDIAL INVESTIGATION REPORT DATA ITEM A011

US ARMY ENVIRONMENTAL CENTER ABERDEEN FROVING GROUND MU 21010-2101

VOLUME II OF II TABLES AND FIGURES

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U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND

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REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT BARABOO, WISCONSIN

FINAL REMEDIAL INVESTIGATION REPORT DATA ITEM A011

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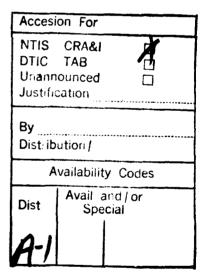
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TABLE 1-1 SUMMARY OF PREVIOUS FIELD INVESTIGATIONS

			•			
				_	PROGRAM ELEMENTS	
	DATE	INVESTIGATIONS	Sites	MONITORING WELL INSTALLATIONS	SURFACE SOIL SAMPLING	Soil Borings
-	1977	U.S. AEHA	Rocket Paste Pond and Ditches	NA	Sediment and Paste Samples from Pond	Surface Water Samples from Pond
6	1979	U.S. Army Corps of Engineers Mobile District	Existing Landfill	3 wells (S1134, S1135, S1136)	NA	AN :
۱			Propellant Burning Ground	3 wells (S1144, S1145, S1146)	¥	¥2
က်	1981	Envirodyne BAAP Contamination Survey	Distributed throughout BAAP	33 wells (S1101 through S1133)	2 sediment samples from NG Pond	ž
					2 sediment samples from Rocket Paste Ditch	
4	1982	USAEHA Phase 2 Hazardous Waste Management Study	Propellant Burning Ground	NA	45 surface soil samples	NA NA
ικό	1982	Warzyn Geological and Soils Survey and Groundwater Monitoring Program	Deterrent Burning Ground	4 wells (DBM-82-01, DBM-82-02, and DBN-82-01A,B ¹)	¥	4 borings (DBB-82-01 through DBB-82-04)
			Propellant Burning Ground	20 wells: 5 sets of well nests, 3 wells per nest (PBN-82-01A,B,C through PBN-82-05A,B,C); 5 single wells (PBM-82-01 through PBM-82-05)	ž	8 borings (PBB-82-01 through PBB-82-08)
			Existing Landfill	12 wells: 4 sets of well nests, 3 wells per nest (ELN-82-01A,B,C through ELN-82-04A,B,C)	NA	6 borings (ELB-82-01 through ELB-82-06)
ý	1983	SARKO Establishment of Five Groundwater Monitoring Wells	Settling Ponds	3 wells (S-83-1147, S-83-1148, and S-83-1149)²	¥ Z	V V
			Other Locations at BAAP	2 wells (S-83-1150 and S-83-1151) ²	AN	NA

TABLE 1-1 SUMMARY OF PREVIOUS FIELD INVESTIGATIONS

					•	
					PROGRAM ELEMENTS	
	DATE	Investigations	SITES	MONITORING WELL INSTALLATIONS	SURFACE SOIL SAMPLING	SOIL BORINGS
7.	1984	Ayres Near-surface Soils Investigation	Final Creek and Settling Ponds	NA	50 surface soil samples	ΑN
			Main Rocket Paste Drainage Ditch		10 sediment samples from Main Rocket Paste Ditch	
j			NG Pond and Overflow Pond		8 sediment samples	
æί	1984	Ayers Near-surface Soils Investigation	Ballistics Creek and Ballistics Pond	Ϋ́	5 creek sediment samples	2
					4 pond sediment samples 2 surface soil samples	
ெ	1984	Ayers Near-surface Soils Investigation	Oleum Plant and Pond Area	NA	8 soil/sediment samples	₹
					3 Control Pond sediment semples	
10.	1984	USAEHA Phase 4 Hazardous Waste Management Study	Propellant Burning Ground	NA	Ą	15 soil borings to 50-foot depth; 70 subsurface soil samples
=	1985	USAEHA Geohydrologic Study	Propellant Burning Ground	10 wells: 4 single wells (PBN-85-01A through PBN-85-04A) and 6 single wells (PBM-85-01 through PBM-85-06)	¥	¥ Z
12.	1985	Foth & Van Dyke Soil Sampling Analysis and Evaluation of Settling Ponds Spoils Sites	Settling Ponds and Spoils Disposal Area	NA	40 samples of dredged settling pond spoils collected from spoils disposal areas	¥ Z
13.	1985	Warzyn Subsurface Investigation at BAAP	Settling Ponds	2 wells consisting of a nested well pair (S-85-1152A.B) ³	Ā	A A
			Existing Landfill	1 well (S-85-1153)³	NA	V.

SUMMARY OF PREVIOUS FIELD INVESTIGATIONS TABLE 1-1

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

					PROGRAM ELEMENTS	
	DATE	INVESTIGATIONS	Sites	MONITORING WELL INSTALLATIONS	SURFACE SOIL SAMPLING	SOIL BORINGS
=	14 1986	U.S. Army Materiel Command Reactivity Testing Program	Propellant Burning Ground	ΥN	22 surface soil samples	٧Z
			Settling Ponds and Spoils Disposal Area	NA	17 surface soil samples	Ψ.
15.	1986	USAEHA	Rocket Paste Ditch	NA	6 soil samples	₹Z
			Rocket Roll Ditch	NA	6 soil samples	
6	1988	U.S. Army Engineer Waterways Experiment Station Geophysical Investigation	Existing Landfill	NA	Ā	NA NA
			Deterrent Burning Ground	NA NA	NA	A

Notes:

1 Wells have since been renumbered as DBN-82-01B and DBN-82-01C.

1 Wells have since been renumbered as S1147, S1148, S1149, S1150, and S1151

2 Wells have since been renumbered as S11524, S1152B, and S1153.

BAAP Badger Army Armunition Plant

NA not applicable

USAEHA U.S. Army Environmental Hygiene Agency

SAIKO R.F. Sarko & Associates

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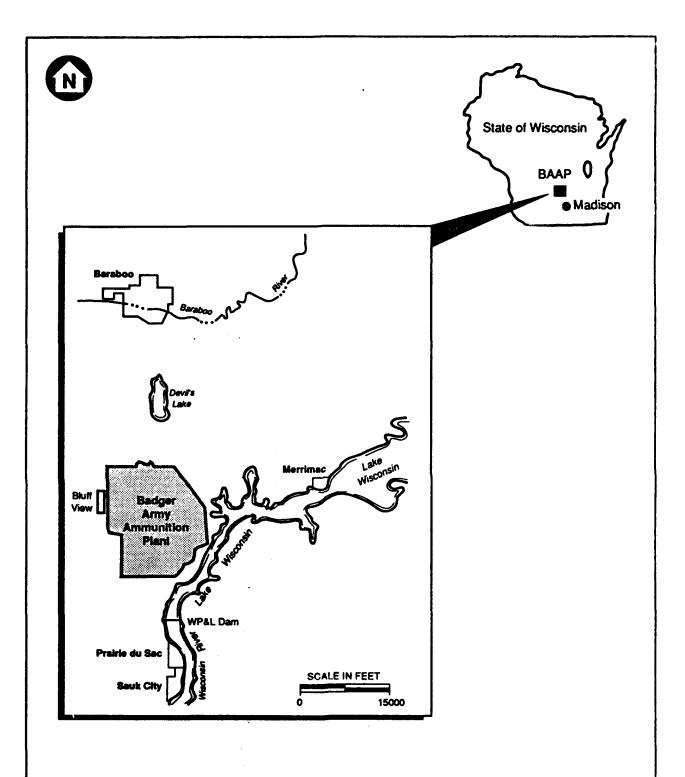
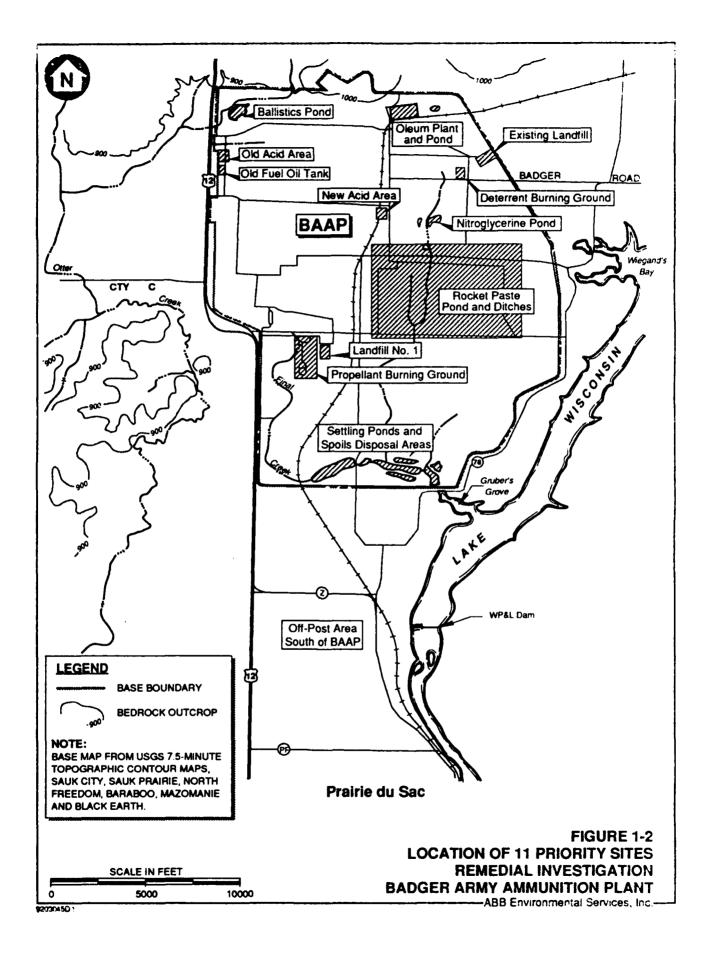


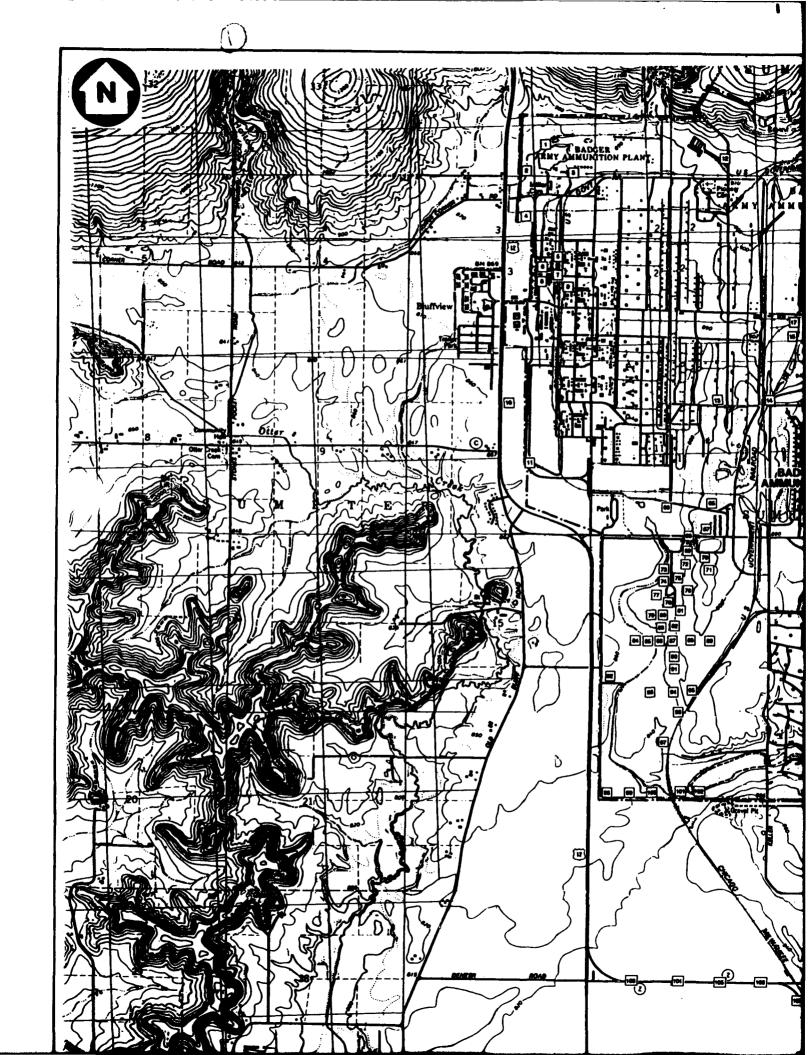
FIGURE 1-1
SITE LOCATION MAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

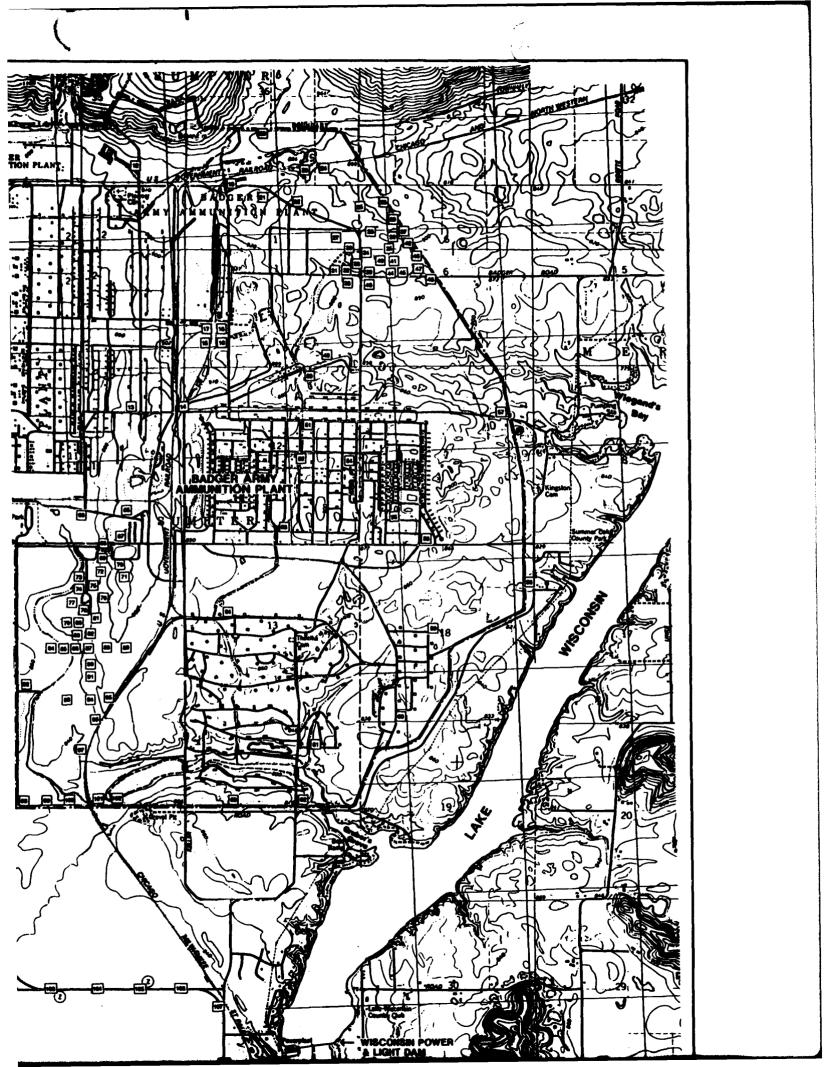
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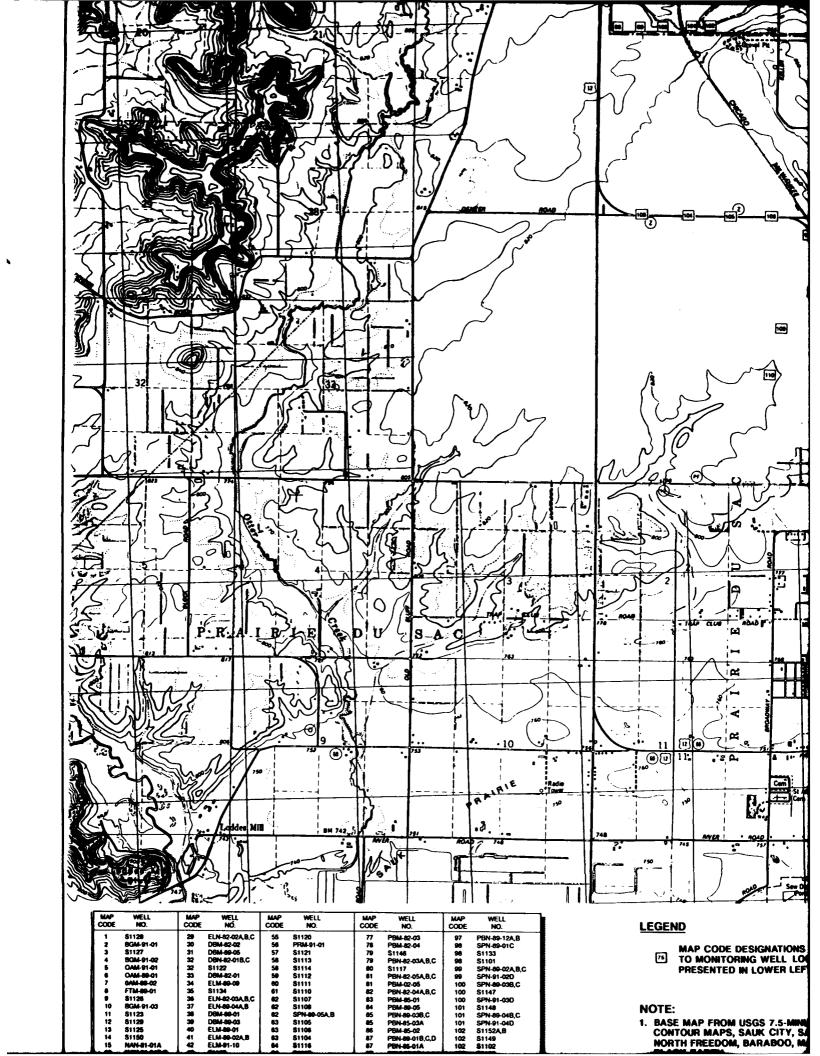
-ABB Environmental Services, Inc.-

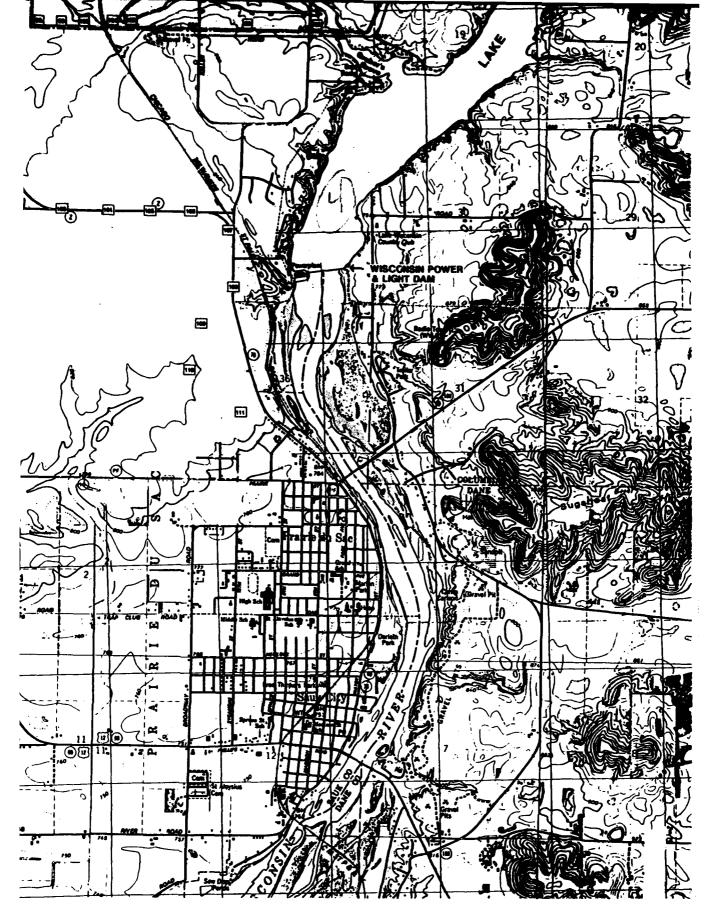
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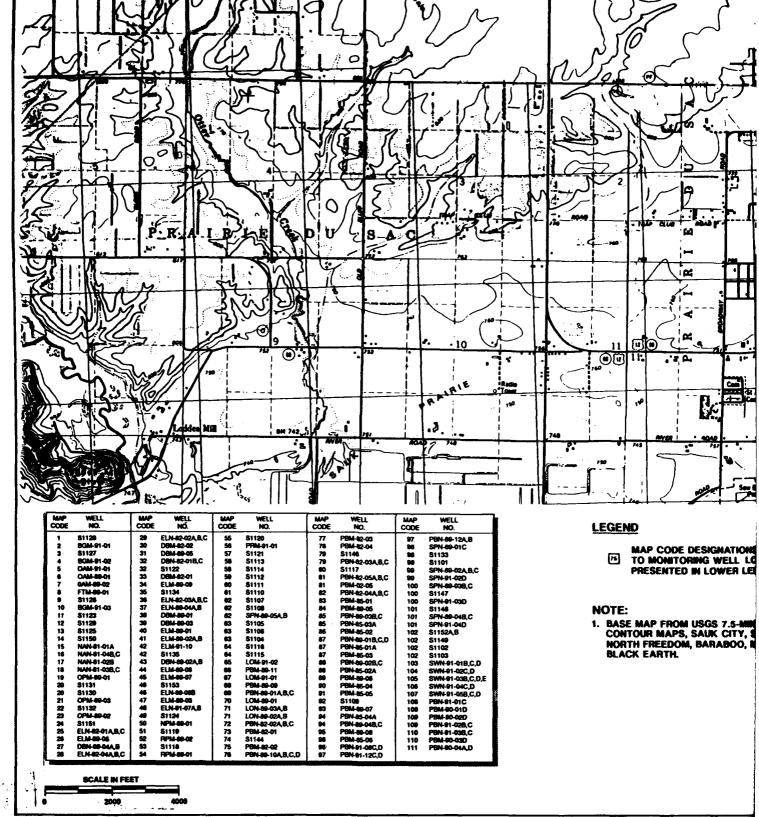


LEGEND

MAP CODE DESIGNATIONS WHICH CORRELATE TO MONITORING WELL LOCATIONS ARE PRESENTED IN LOWER LEFT-HAND CORNER.

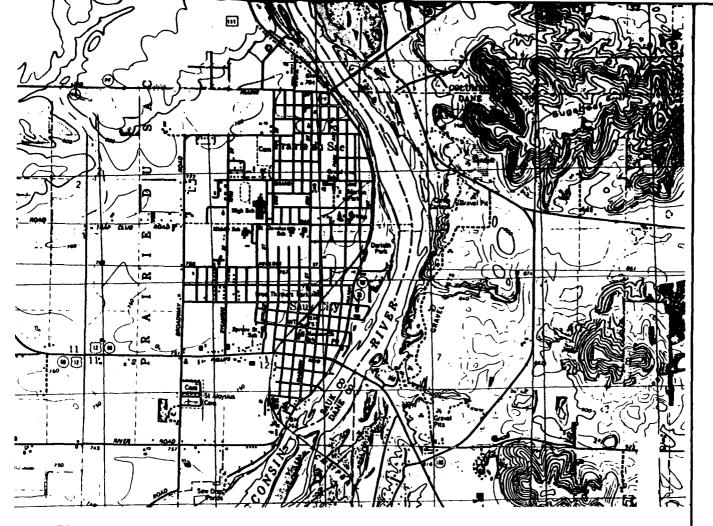
NOTE:

BASE MAP FROM USGS 7.5-MMUTE TOPOGRAPHIC CONTOUR MAPS, SAUK CITY, SAUK PRAIRIE, NORTH FREEDOM, BARABOO, MAZOMANIE AND MACK EARTM.



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LEGEND

MAP CODE DESIGNATIONS WHICH CORRELATE TO MONITORING WELL LOCATIONS ARE PRESENTED IN LOWER LEFT-HAND CORNER.

NOTE:

1. BASE MAP FROM USGS 7.5-MINUTE TOPOGRAPHIC CONTOUR MAPS, SAUK CITY, SAUK PRAIRIE, NORTH FREEDOM, BARABOO, MAZOMANIE AND BLACK EARTH.

FIGURE 1-3
MONITORING WELLS SAMPLED
DURING THE REMEDIAL INVESTIGATION
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

ABB Environmental Services, Inc.

TABLE 2-1 LOCATION AND CURRENT USE OF BAAP PRODUCTION WELLS

WELL.	LOCATION	USE
PW-1	Approximately 600 feet southeast of administration building 200.	Potable water supply at BAAP; tested quarterly per WDNR regulations; screened in bedrock.
PW-2	Approximately 100 feet north of New Acid Area.	Process water source for BAAP; no current testing; screened in bedrock.
PW-3	Approximately 1,000 feet north of Old Acid Area.	Currently out of service; used for water levels by USGS; screened in bedrock.
PW-4	Approximately 1,200 feet northwest of the Deterrent Burning Ground and approximately 1,600 feet southeast of the Oleum Pond.	Backup to PW-2 for process water; screened in sand and gravel.
PW-5	Approximately 400 feet west of the Propellant Burning Ground.	Not currently used, but still functional; screened in bedrock.

TABLE 2-2 SUMMARY OF BORINGS/MONITORING WELLS INSTALLED -BACKGROUND AREAS

WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (FT.)	ELEVATION OF BASE OF SCREEN (FT. MSL)	LENGTH OF WELL SCREEN (FT.)	LOCATION	PURPOSE
BGM-91-01	Dual-Wall Driven Casing	78.0	802.5	10	Upgradient and west of Ballistics Pond	To assess background subsurface soil and groundwater quality upgradient of BAAP
BGM-91-02	Dual-Wall Driven Casing	87.0	790.6	10	Upgradient and northwest of Old Acid Area	To assess background subsurface soil and groundwater quality upgradient of BAAP
BGM-91-03	Dual-Wall Driven Casing	100.0	761.6	10	Upgradient and south of Administration Building	To assess background subsurface soil and groundwater quality upgradient of BAAP

TABLE 2-3
BACKGROUND METALS CONCENTRATIONS IN SURFACE SOIL

			SAMPLE LOCATION	OCATION			REGIONAL DATA	DATA
BACKGROUND METAL CONCENTRATION	BSS-90-01	BSS-90-02	BSS-90-03	BSS-90-04	B\$\$-90-05	Mean Concen.	CONCEN. RANGE	MEAN CONCEN.
AS	8.47	8.44	8.00	4.19	4.81	6.78	1.9 - 16.0	9.6
AG	LT 0.803	LT 0.803	LT 0.803	LT 0.803	LT 0.803		0.03 - 2.8	
ΑŁ	34300	41100	41100	21500	26100	32820	LT 700 - 50000	33000
BA	208	500	201	220	289	224	200 - 1500	675
38	1.12	1.46	1.52	0.785	1.00	1.18	LT 1 · 15	0.55
ð	3190	3440	3570	3440	4300	3588	3500 - 5200	3400
8	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20		0.41 - 0.51	
8	12.6	11.8	12.1	8.37	12.8	11.5	3 · 30	Ŧ
E O	37.4	46.8	40.4	23.3	29.8	35.5	10 - 100	55
3	14.2	20.9	18.5	7.46	9.78	14.2	7 - 100	x
ш	33700	38100	36700	18800	23200	30100	100 - 30000	14000
9	LT 0.05	0.063	LT 0.05	0.19	LT 0.05	0.066	0.01 - 0.38	90:0
¥	2560	4070	4330	2690	3670	4004	2200 - 65000	12000
Ø	5720	6340	2800	3020	3850	4946	50 - 7000	2100
N	772	647	647	810	1400	855	50 - 1500	222
NA A	114	181	195	128	175	158	3000 - 10000	2500
Z	23.5	27.9	24.9	13.9	16.7	21.4	5 - 30	11
80	10.9	10.0	LT 7.44	12.9	15.8	10.7	10 - 30	9
SB	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6		0.25 - 0.60	0.52
SE	LT 20.7	LT 20.7	LT 20.7	LT 20.7	LT 20.7		0.02 - 0.70	0.26
11	LT 34.3	LT 343	LT 34.3	LT 34.3	1.1 34.3		0.02 - 2.8	

BACKGROUND METALS CONCENTRATIONS IN SURFACE SOIL TABLE 2-3

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

			SAMPLE LOCATION	OCATION			REGIONAL DATA	L DATA
BACKGROUND METAL CONCENTRATION	3SS-9C	-01 BSS-90-02	BSS-90-03	BSS-90-02 BSS-90-03 BSS-90-04 BSS-90-05	BSS-90-05	Mean Concen.	CONCEN. RANGE	MEAN CONCEN.
>		90.0	91.3	45.7	56.7	71.9	LT 7 - 100	£ 7
Z,	79.4	71.9	60.3	52.9	81.3	69.2	28 - 45	Q

Notes:

- ÷ 01 02 4. 10, 00
- All concentrations are in UG/G, equivalent to parts per million Samples are located on Figure 2-6 and were collected on September 5 to 6, 1990. Regional data based upon Shacklette & Boerngen, 1984 and Kabata-Pendlas & Pendias, 1984.
- Laboratory data summarized in Appendix K.
 LT (less than) indicates the analyte was not detected above the certified reporting limit.
 If an LT value was present in a range of concentrations for an analyte, the mean concentration for the analyte was calculated using one-half the LT value (or Certified Reporting Limit).

TABLE 2-4
BACKGROUND ANALYTE CONCENTRATIONS IN SUBBURFACE SON.

		BGM-91-01			BGM-91-02			BGM-91-03			
BACKGROUND ANALYTE CONCENTRATION	20-22′	40-42.	6 0- 6 2′	20-22′	40-42,	60-62′	20-22,	40-42,	60-62′	CONCEN. RANGE	MEAN CONCEN.
AS	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.5
AG	LT 0.803	LT 0.803	LT 0.803	LT 0.803	LT 0.803	LT 0.803	LT 0.803	LT 0.803	LT 0.803	. LT 0.803	LT 0.803
¥	5060	1230	1550	923	1400	1290	2320	1330	2280	923-2320	1598
8	7.80	3.99	4.33	LT 3.29	4.27	3.67	5.58	3.67	5.84	LT 3.29-7.8	4.53
96	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427	LT 0.427
ర	00009	13900	20600	12200	17300	22300	26200	21400	19800	13900-60000	23678
8	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20	LT 1.20
8	LT 2.50	LT 2.50	LT 2.50	LT 2 50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50	LT 2.50
క	3.81	3.36	3.83	1.89	3.63	2.60	10.4	4.47	3.04	1.89-10.4	4.11
3	16.9	15.2	10.5	5.79	LT 2.84	4.77	27.5	13.1	84.8	2.84-27.5	11.52
Ħ	, 5620	3060	2650	1620	2890	3060	5080	2810	2430	1620-5650	3580
ñ	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05
¥	375	225	284	169	314	178	270	267	305	178-375	265
ØW	31900	7450	11000	5950	8780	11100	13000	10600	0996	5950-31900	12160
×	383	68.7	87.7	48.6	82.7	77.9	119	79.4	901	48.6-383	117
ž	213	144	154	93.8	140	35	154	124	236	93.8-236	157
Z	4.22	LT 2.74	LT 2.74	LT 2.74	LT 2.74	2.82	6.19	3.90	LT 2.74	LT 2.74-6.19	2.66
89	3.97	1.09	1.11	0.894	1.18	0.612	1.79	1.04	0.915	0.612-3.97	1.40
88	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6	LT 19.6
SE	LT 0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449	LT 0.449	LT 0 449	LT 0.449	LT 0.449
7	LT 0.5	LT 0.5	LT 20	LT 0.5	LT 0.5	LT 20	LT 0.5	LT 0.5	LT 0.5	LT 0.5-LT 20	LT 4.83
>	230	15.0	19.0	13.0	11.0	22.0	14.0	200	8.60	8.6-23	16.0

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BACKGROUND ANALYTE CONCENTRATIONS IN SUBSUMFACE SOIL TABLE 2-4

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

		BGM-91-01			BGM-91-02			BGM-91-03			
BACKGROUND ANALYTE CONCENTRATION	20-22,	40-42'	60-62'	20-22,	40-42'	60-62	20.22′	40-42.	60-62′	CONCEN. RANGE	MEAN CONCEN.
Ŋ	10.7	9.52	9.31	3.62	9.4	3.36	19.3	7.76	4.75	3.36-19.3	8.04
TCLP METALS (wg/!)											
8	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78	LT 6.78
8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8	LT 16.8
Ð	0.103	LT 0.1	LT 0.1	LT 0.1	LT 0.1	LT 0.1	LT 0.1	LT 0.1	LT 0.1	LT 0.1-0.103	0.056
8	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4	LT 43.4
Anione											
EN	LT 1.0	1.18	69.	2.47	3.42	2.83	3.47	4.07	3.87	LT 1.0-4.07	2.61
SO4	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0	LT 5.0
Hd	9.19	10.2	8.77	9.08	9.63	9.89	9.31	9.36	9.35	8.77-10.2	9.42

Notes:

Concentrations are in µg/g, equivalent to parts per million Samples are located on Figure 2-6 and were collected in October and November 1991. Regional data based upon Shacklette & Boerngen, 1984 and Kabata-Pendias & Pendias, 1984.

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Laboratory data summaized in Appendix K.
LT (fess than) indicates the analyte was not detected above the certified reporting limit.
If an LT value was present in a range of concentrations for an analyte, the mean concentration for the analyte was calculated using one-half the LT value (or Certified Reporting Limit).

TABLE 2-5
TCLP METALS DATA SUMMARY FOR SUBSURFACE SOIL BACKGROUND BORINGS

	T1	CLP LEAC	HATE CONCE	ENTRATION (J	g/ <i>t</i>)	
SAMPLE LOCATION	DEPTH	CD	CR	PB	HG	Notes
TCLP RL1		1,000	5,000	5,000	200	
Minimum Reporting Value		6.8	16.8	43.4	0.1	
BGM-91-01	22	LT	LT	LT	0.1	TCLP RL not exceeded
BGM-91-01	42	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-01	62	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-02	22	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-02	42	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-02	62	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-03	22	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-03	42	LT	LT	LT	LT	TCLP RL not exceeded
BGM-91-03	62	LT	LT	LT	LT	TCLP RL not exceeded

Notes:

and the second s

TCLP Regulatory Level (RLs) exist for the following metals: AS, BA, CD, CR, SE, PB, HG, and AG. However, samples were only analyzed for CD, CR, PB, and HG. (See List of USATHAMA Chemical Codes for definitions of chemical abbreviations).

LT - Less than the Certified Reporting Limit; corrected for percent moisture, dilution, and percent recovery.

Sample locations shown on Figure 2-6.

TABLE 2-6
SUMMARY OF AVERAGE BACKGROUND GROUNDWATER QUALITY DATA-BACKGROUND AREAS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:			-16-MD	01	BG	BGM_01-02	700	000		
Sample Type: UNITS:	ü		WELL			WELL	A S	WELL	WELL	~
DATE SAMPLED:	(PLED)	12/06/91		04/09/92	12/07/01		ט ישישני			
ROUND:		ONE		TWO	ONE	TWO	ONE	74/34/32 174/0	12/05/91 ONF	04/14/92
VOC	CH2CL2	3.82	•	7.06 18	5	g 76.7	637			Su I
	CHCL3	ı	•		•	0.0). (-)	6.37 18	5.2	5.2
	TCLEE	1		,		ı	1	0.624 P	•	ı
SVOC	RZEHP					-		0.386 P		•
Metale	T P					193 X	1	57.3	•	,
	? ₹	ı		;	ı	ı	•	,	•	•
	7	ı		,	•	ŧ	•	1	1	
	₹;	ı		ì	•	ı	•	ì	•	1
	BA	24.7		14.6	27.5	26.6	30.5	27.8	156	. ;
	BE	ı		1	ŧ	•		1	Ç.	7.8
	Š	91000		36000	28000	00008	74000	24000	, of	· {
	8	•		•		,		200	3	3
	క	7.31		1	95.9	ı	1 4	•	, (,
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1	500	18000		0006	16000	16000	27000	29000	16000	17000
101201011	AL.	232000		303000	. 188000	212000	210000	224000	252000	34KOM
parameter	HAKE	282000		1,0000	2,58000	242000	312000	304000	240000	30500
	S	257000		171000	243000	260000	296000	307000	348000	0000
	pH(1)	7.		6.5	8.2	6.5	8 .4	1.7	2.0	2,5
	Sp.Cond.(2)	539		300	\$22	415	5 09	515	8	3
										CD.

Notes and flagging codes are presented at the end of this table.

TABLE 2–6
SUMMARY OF AVERAGE BACKGROUND GROUNDWATER QUALITY DATA—
BACKGROUND AREAS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: UNITS:			WELL				WELL				WELL				
DATE SAMPLED: ROUND:	ä	12/04/91 ONE		04:09/92 TWO		11/24/91 ONE		04/08/92 TWO		11/24/91 ONE		04/08/92 TWO	INSTALLATION AVERAGE (3)	CONCENTRATION	
VOCs C	CH2CL2	5.1	۵.	6.57	~	4.8	۵.	96.9	•	4.71	۵,	€.86 ₱	Y Z	4 / X	
	CHCL3	ı		1		1		,		1			V / X	< <u>×</u>	
	TCLEE	ı		ı		ı		1		ı	•	ı	Y/X	Y/X	
	BZEIIP	1		41.4	Ь	1				33.4	۵.	•	V/V	Y/N	
Metals	٧G			,		ı		1				1	٧X	Y/X	
	۸L	ı		1		•		•		•		ı	V/X	\ Z	
	YS	ı		,		•		1		1		ı	V/X	4 /Z	
	BA	35.4		æ		27.9		14.7		32.5		222	12	14.6-36.2	_
	BE	ı		ı		•		ı		١		ı	Y/X	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
	ð	000+9		61000		26000		31000		31000		24000	\$2000	24000-77000	
	9	1		ı		ŧ		•		•		ı	4 / X	4 2	
	د	11.6		1		4		1		4.79		ı	4.5	CRI11.6	
	D C	ı		ı		ı		•		ı		7.22	3.6	CRL-18	
	끮	108		ı		47.6		1		29.1		64.2	3 .	CRL-266	_
	HG	1		ı		ı		3.93		1		•	65.0	CRL-3.93	
	¥	3 00	-	1140	⊣	456	ı	866	H	693	L	7 00¢	1040	456-1680	_
	MG	34000		32000		16000		17000		19000		13000	27000	16000 - 39000	
	Z	1		ł		ı		ı		1		ı	Y X	4 /Z	
	₹	22000	_	19000	- -	2030	۲	3300	⊢	2320	H	2550 T	11610	9900 - 25000	
	Z	1		1		,		ı		1		ı	5.4	CRL-18.1	
	6	ı		ı		1		ı		1		69	3	CRL-69	_
	SB	ı		1		ı		1		ı		1	X	٧/٧	
	SE	•		ı		1		1		ı		1	Y X	4 /Z	
	>	1		ı		ı				4.88		1	7.6	CRI11.3	
	ZN	ı		,		89		ı		46.8		91.9	77	CRL- 91.9	
Anions	TIN	370		220		900		780		350		740	3300	75.4-1000	
	ರ	\$4000		46000		\$600		4200		3600		9	18000	3600-54000	
	804	41000		38000		6200		19000		18000		0059	20000	6200 41000	
Indicator	AI.K	232000		234000		226000		100000		125000		92000	205000	92000 - 303000	
parameter	HARD	310000		290000		120000		132000		144000		122000	230000	120000 - 312000	
	TDS	401000		339000		157000		155000		209000		148000	258000	148000401000	
	pH(1)	7.7		7.7		6.5		5.2		7.0		7.0	7.3	5.2- 84	_
	Condition	Ę		3		777		757		200		700			_

Notes and flagging codes are presented at the end of this table.

TABLE 2-6 SUMMARY OF AVERAGE BACKGROUND GROUNDWATER QUALITY DATABACKGROUND AREAS REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

inter and Respins codes

		For analytes not detected above the CRL, averages are calculated										•					
unites	Specific conductivity, umhos/cm	Average concentrations are calculated for all analytes with one or more detected values.	assuming a concentration of one-half the CRL.	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits	Not Applicable
									ŭ	•						*	*
Ξ	(2)	:E		nor	NOC.	SVOC	Blank cell	•	15	æ	0	۵.	~	S	1	×	V/N

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The CRL average concentrations were not calculated for analytes not detected above CRL or analytes outside certified range.

Appendix K contains complete analytical results.

USATHAMA chemical codes are defined in the RI Report Glossary.

TABLE 2-7
BACKGROUND SEDIMENT CONCENTRATIONS - REGIONAL

TABLE 2-7
BACKGROUND SEDIMENT CONCENTRATIONS - REGIONAL

CHEMICAL	CRYSTAL LAKB	DELAVAN LAKE	DEVIL'S LAKE	LOST	LAKE	CONCENTRATION RANGE	MEAN
		\$40.0		90.06	1060.0		
Z	8.0	0.1	37.0	0.0	4.0	1.0 - 37.0	12.7
	7.0	-	30.0	14.0	14.0		,
		7.0		14.0	13.0		
٧X	500.0	400.0	<300.0	<300.0	<300.0	<300.0 - 500.0	223.1
	200.0	<300.0	<300.0	<300.0	<300.0		
		<300.0	-	<300.0	<300.0		

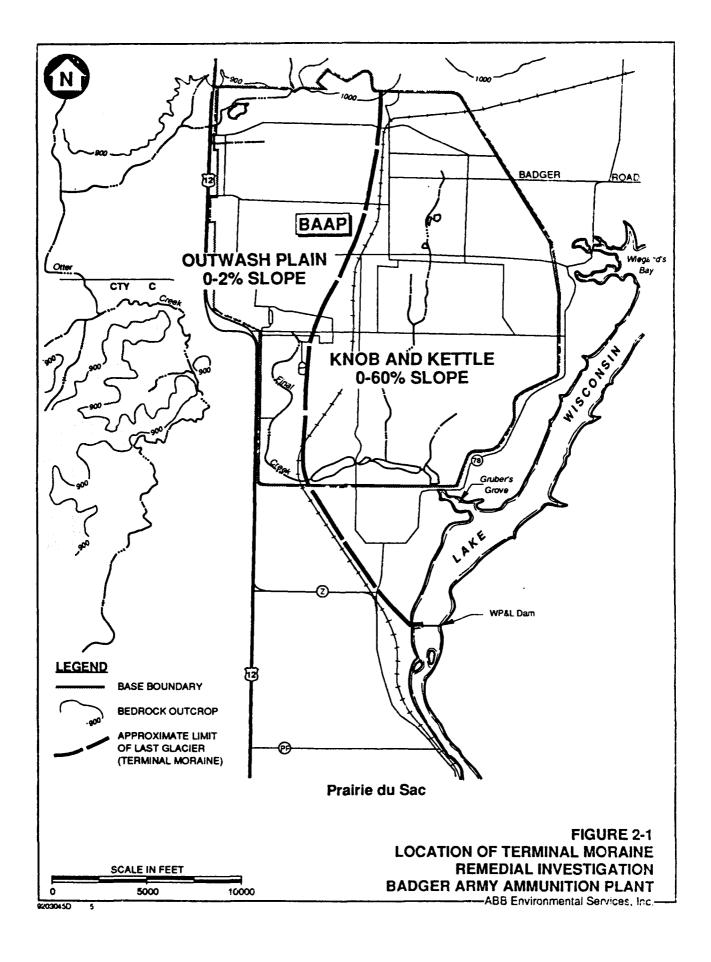
 All concentrations are in ug/g, equivalent to parts per million.
 Blank Space indicates a sample was not taken.
 Source: WDNR 1989, Technical Bulletin 163 "Mercury Levels in Walleyes from Wisconsin Lakes of Different Water and Sediment Characteristics."

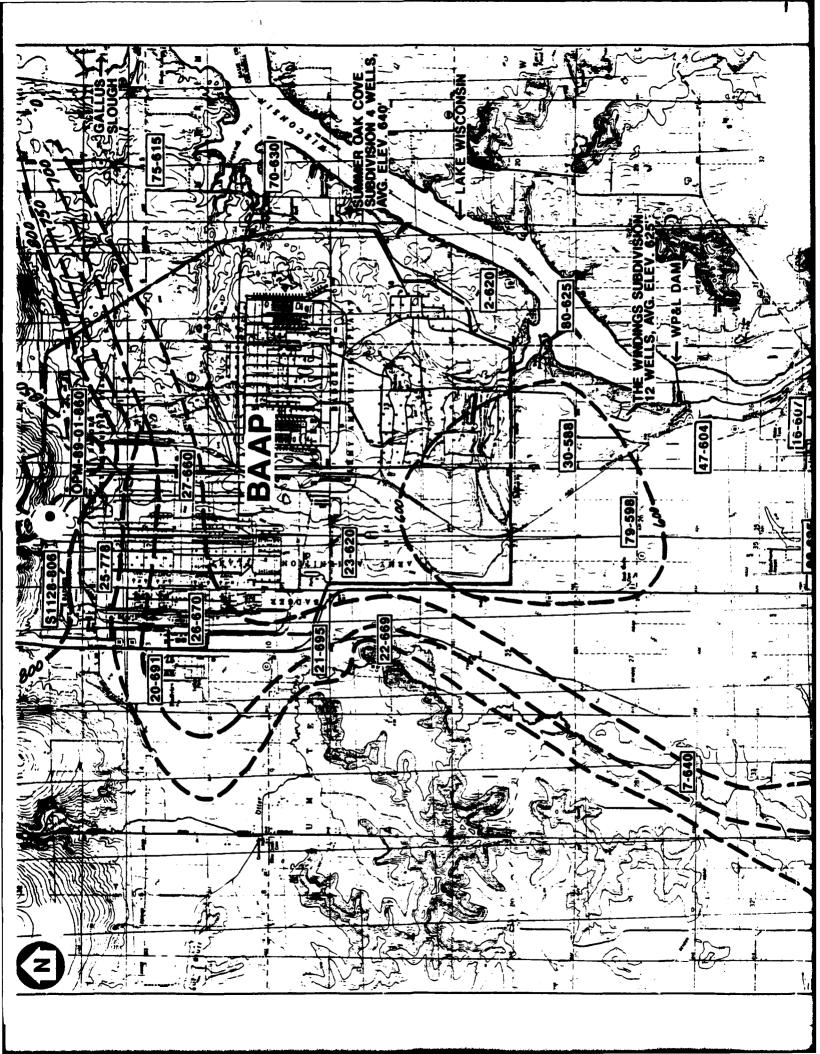
TABLE 2-8 **BACKGROUND SEDIMENT CONCENTRATIONS - CONTROL POND**

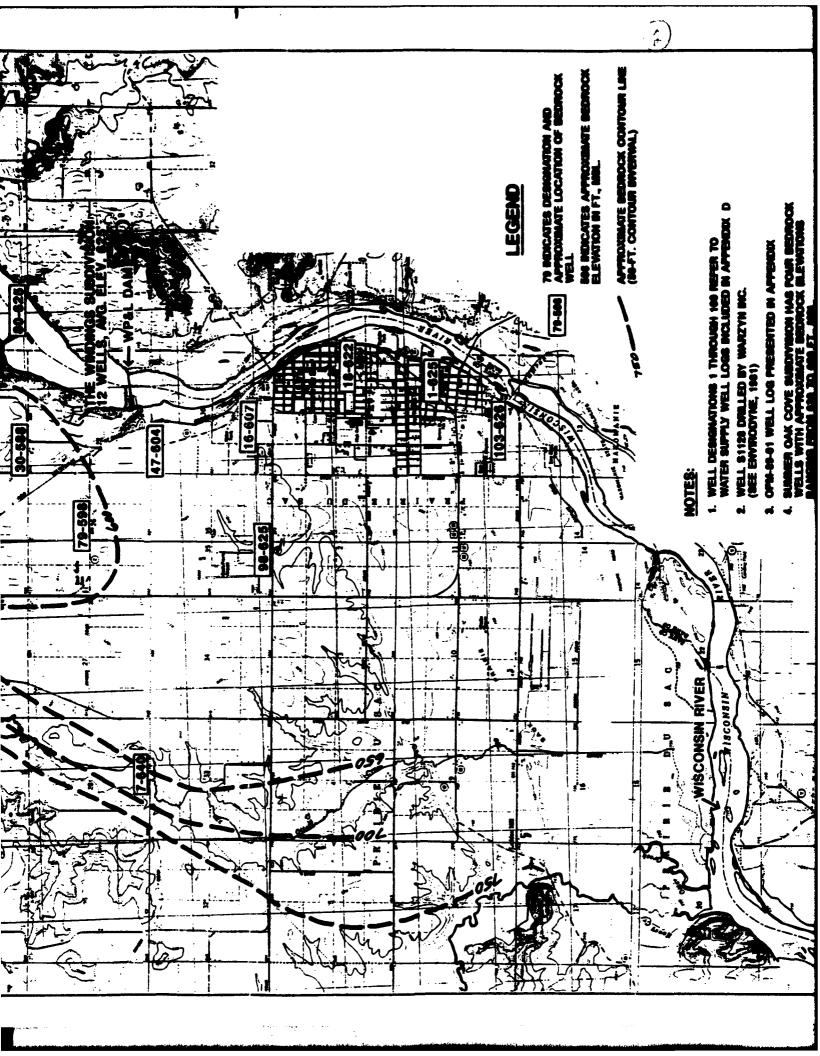
. ,		SAMPLE	
TOTAL METALS AND INORGANICS	CP-1	CP-2	СР-3
PB (Lead)	7.3	12	25
NIT (Nitrogen-Nitrate)	1.0	0.11	0.12
NH3N2 (Ammonia-Nitrogen)	53	230	320
BOD (Biochemical Oxygen Demand)	<15	180	170
COD (Chemical Oxygen Demand)	< 1000	23,000	25,000
рН	7.38	7.17	7.70
SO4 (Sulfate)	<20	<20	<20
TOTAL SOLIDS	93%	79%	65%

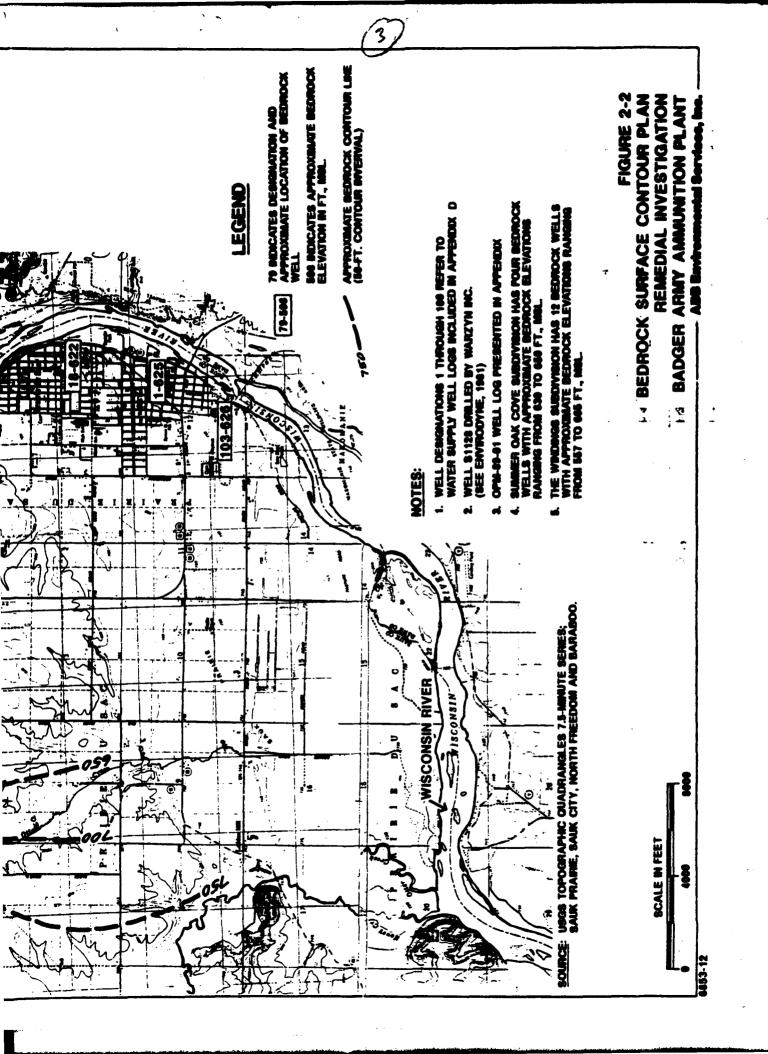
Notes:

(1) (2) Source: Ayres, 1984 All results are dry weight basis and are listed in $\mu g/g$. This Page Intentionally Left Blank.









BADGER BAAP WISCONSIN WP&L Dam Prairie du Sac Well No. 2 SCALE IN FEET Prairie du Sac 4000 8000 0 92120070 34

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Prairie du Sac Well No. 2

COOR	WELL	ELEVATION	MAP	WELL (ELEVATION	144 0001	WOLL (BLEVAT
1	91-66P	707,7	27	NUH-02-05A	774.6	*	81144	770
2	91- 60 P	776.5	28	91-40P	774.7	54	PBN-02-04	
3	\$1126	770.1	-	91-38P	773.^	#	PBN-85-01/	\ 786
4	BGM-01-03		30	81113	773.7	-	PBM-00-05	700
5	81136	705.1	31	81112	772.1	57	8 1100	706.
6	OAM-81-01	705.6	32	\$ 1111	700.8	- 56	PBN-05-04	
7	BGM-01-02	700.6	33	3 111 0	706.0	50	PBM-00-06	700.
	BGM-01-01	814.5	34	81115	770.8	60	PBM-05-06	705.
9	3 11 27	824.4	35	81118	773.8	61	PBN-00-12/	1 704
10	OPM-89-03	776.9	36	RPM-01-01	773.8	62	81101	761.4
11	S 11 32	777.A	37	\$1120	774.2	•	\$1147	702.
12	OPM-88-02	777.9	36	RPM-89-01	774.8	84	81146	701.
13	81151	777.9	39	RPM-00-02	774.8	65	\$1102	701.
14	ELM-89-05	777.5	40	81119	775.5	- 66	81140	700.
15	\$1153	777.1	41	NPM-89-01	776.1	67	81104	700
16	DBN-00-02/		42	81124	776.5	•	87N-89-05/	
17	ELN-01-07/	776.9	43	NAN-81-01/			SWN-01-08	
18	91-48P	777.0	44	81150	776.6	70	SWN-01-04	
19	91-47P	776.2	45	81125	777.0	71	SWN-01-03	
20	91-46P	776.2	46	PBM-89-11	773.9	72	SWN-01-02	
21	91-45P	776.5	47	LOM-01-02	773.7	73	SWN-01-01	
22	91-44P	776.5	44	LOM-91-91	772.8	74	PBN-01-010	
23	91-42P	776.0	49	PBM-09-09	772.2	75	PBN-01-025	
24	91-43P	775.5	50	LOM-00-01	<i>7</i> 71.7	76	PBN-01-035	742.
25	S 1121	775.2	51	LON-89-03/	771.1	77	PBN-80-04	3 730.
26	NLN-82-01/	775.0	52	PBN-62-02/	771.4			

LEGEND

740___

REGIONAL WATER TABLE CONTOU



BEDROCK OUTCROP



DIRECTION OF GROUNDWATER FLOW

MONITORING WELL OR PIEZOMETE

USED TO DETERMINE CONTOURS

NOTES:

- BASE MAP FROM USGS 7.5-MINUTE TOPOGRAPHIC CONTOUR MAPS, SAUK CIT SAUK PRAIRIE, NORTH FREEDOM, BARABI MAZOMANIE, AND BLACK EARTH.
- 2. WATER LEVELS MEASURED 12/15/91.
- 3. CONTOURS IN FEET MSL.

FIGI REGIONAL WATER TABLE CONTOU REMEDIAL INVESTI BADGER ARMY AMMUNITION

-ABB Environmental Se

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MAP	WELL	GROUNDWATER ELEVATION	MAP	WELL (ELEVATION	MAP	WELL MUMBER	GLEVATION
1	91-66P	767.7	27	NLH-02-05/	774.6	\$3	81144	770.8
2	91- 56P	776.5	26	91-40P	774.7	54	PBN-82-04/	
3	\$1125	779.1	29	91-30P	773.7	55	PBN-85-01/	
4	BGM-01-03	789.2	30	\$1113	773.7	50	PBM-00-05	706.0
5	81126	785.1	31	\$1112	772.1	57	\$1109	706.7
6	OAM-91-01	705.6	32	81111	708.8	59	PBN-85-04/	A 705.6
7	BGM-91-02	798.6	33	\$1110	766.0	50	PBM-89-08	. 706.1
	BGM-91-01	814.5	34	81115	770.8	80	PBM-85-06	705.3
9	\$1127	824.4	35	\$1118	773.8	61	PBN-89-12	N 764.4
10	OPM-89-03	776.9	36	RPM-01-01	773.8	62	81101	761.9
11	S1132	777.4	37	81120	774.2	63	81147	702.3
12	OPM-89-02	777.9	36	RPM-89-01	774.8	64	81146	761.9
13	\$1151	777.9	30	RPM-89-02	774.8	85	81102	761.7
14	ELM-89-05	777.5	40	\$1119	775.5	-	81149	702.7
15	81153	777.1	41	NPM-89-01	776.1	67	81104	702.A
16	DBN-89-02	A 777.0	42	S1124	776.5	•	SPN-89-05/	702.7
17	ELN-91-07/	A 776.9	43	NAN-81-01/	777.1		SWN-91-05	8 746.3
18	91-48P	777.0	44	\$1150	776.6	70	SWN-91-04	C 750.9
19	91-47P	776.2	45	81125	777.0	71	SWN-01-03	8 752.3
20	91-46P	776.2	46	PBM-89-11	773.9	72	SWN-01-02	C 759.8
21	91-45P	776.5	47	LOM-01-02	773.7	73	SWN-01-01	B 754.8
22	91-44P	776.5	48	LOM-91-01	772.8	74	PBN-01-010	743.0
23	91-42P	776.0	49	PBM-00-09	772.2	75	PBN-91-025	742.9
24	91-43P	775.5	50	LOM-89-01	771.7	76	PBN-91-036	3 742.1
25	S1121	775.2	51	LON-89-03/	771.1	77	PBN-80-04	B 738.8
26	NLN-62-01		52	PBN-82-02/	771.4			

LEGEND



REGIONAL WATER TABLE CONTOUR LINE



BEDROCK OUTCROP



DIRECTION OF GROUNDWATER FLOW

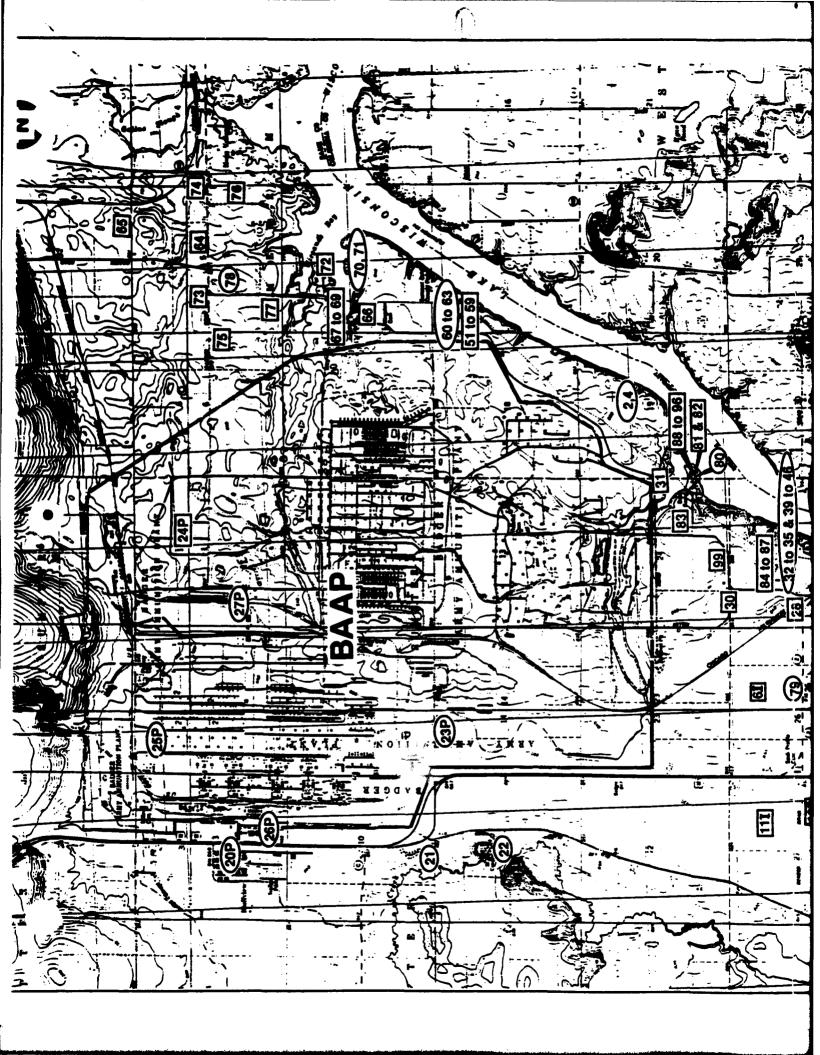
MONITORING WELL OR PIEZOMETER USED TO DETERMINE CONTOURS

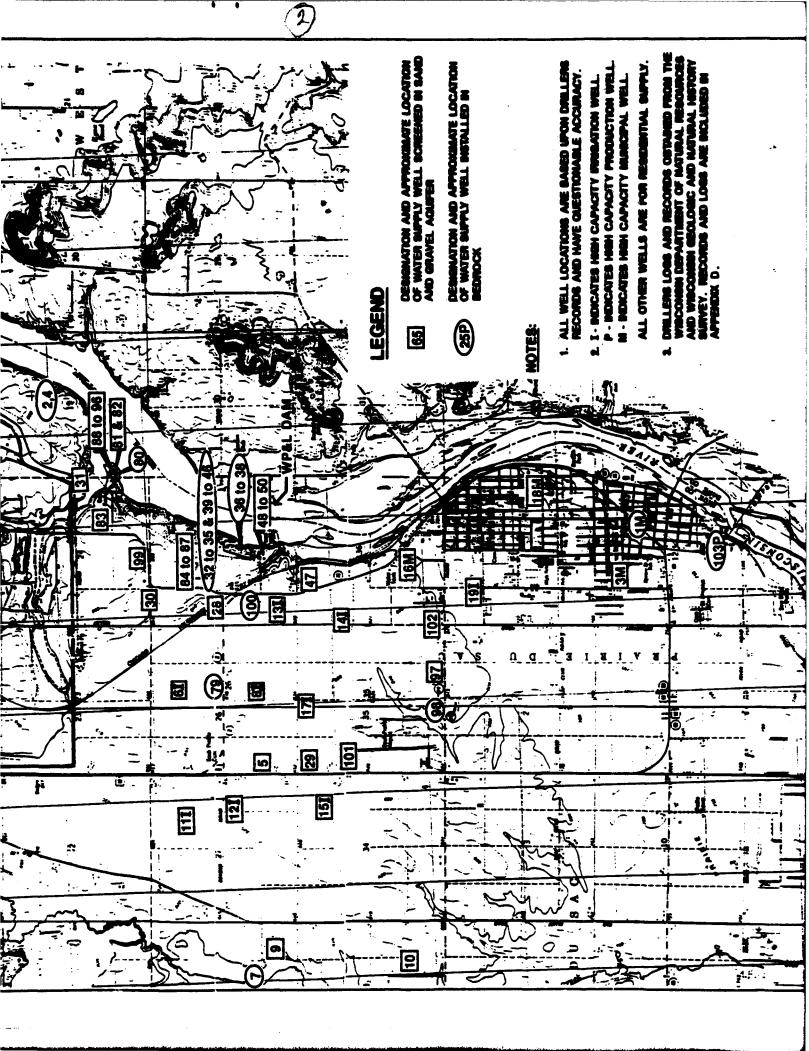
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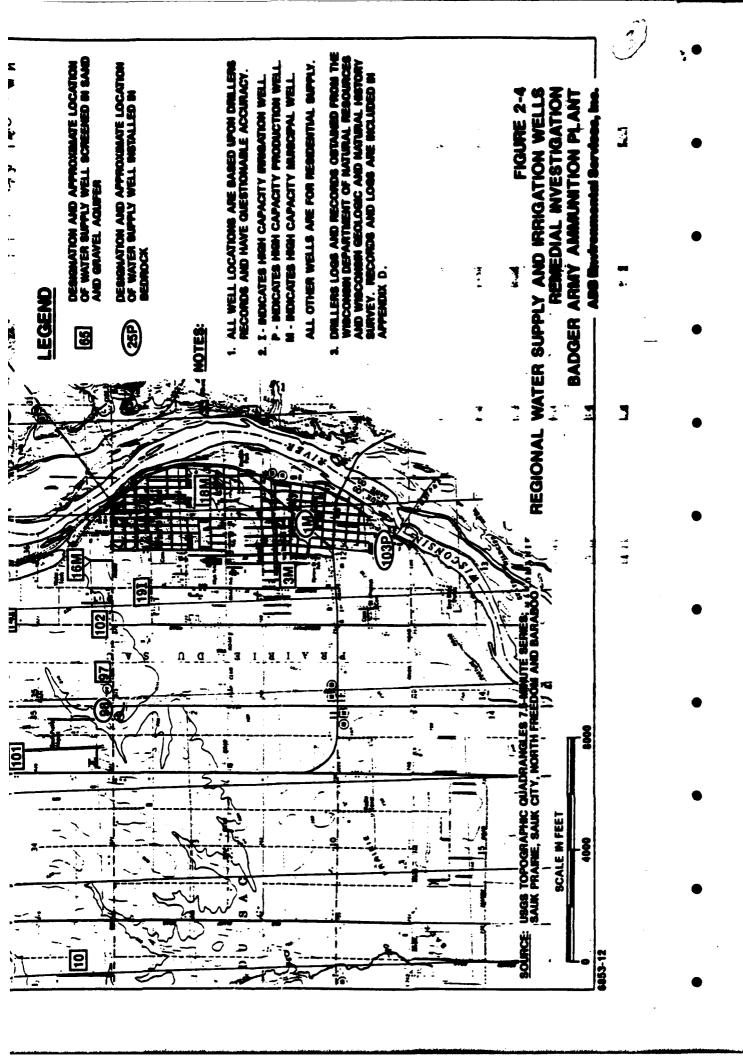
- 1. BASE MAP FROM USGS 7.5-MINUTE TOPOGRAPHIC CONTOUR MAPS, SAUK CITY, SAUK PRAIRIE, NORTH FREEDOM, BARABOO, MAZOMANIE, AND BLACK EARTH.
- 2. WATER LEVELS MEASURED 12/15/91.
- 3. CONTOURS IN FEET MSL.

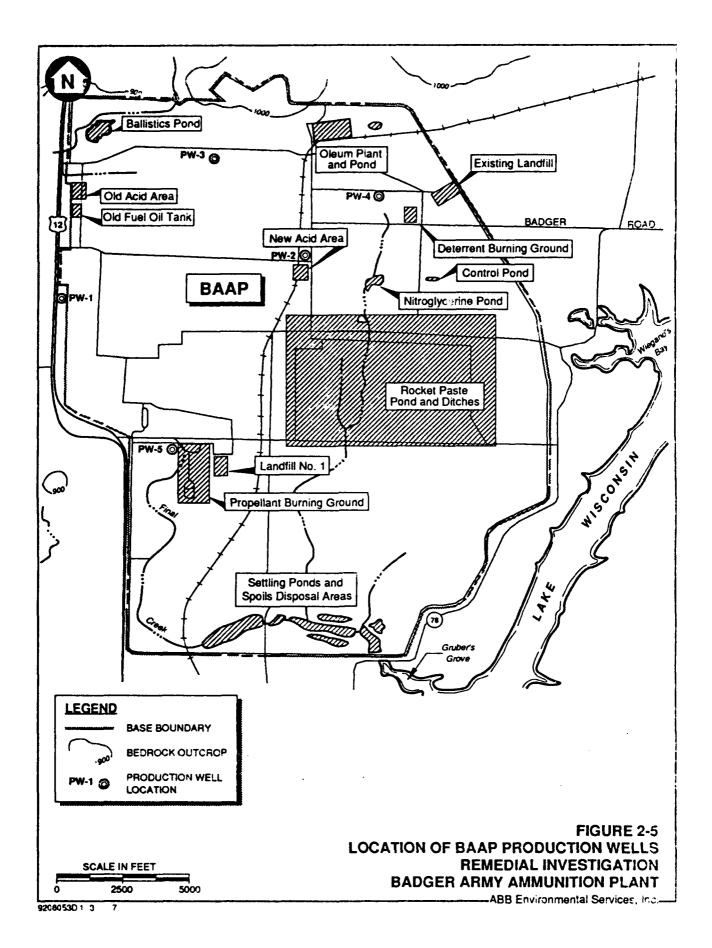
FIGURE 2-3
REGIONAL WATER TABLE CONTOUR PLAN
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

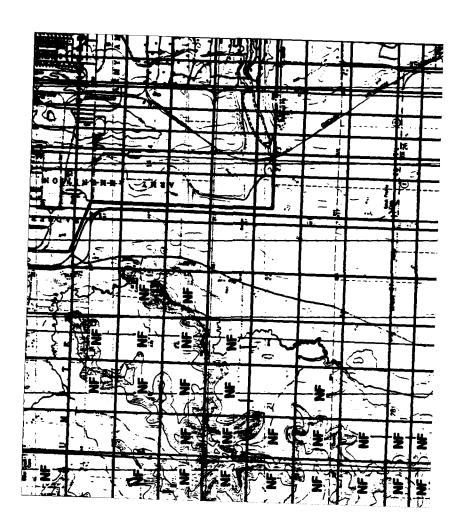
-ABB Environmental Services, Inc.-

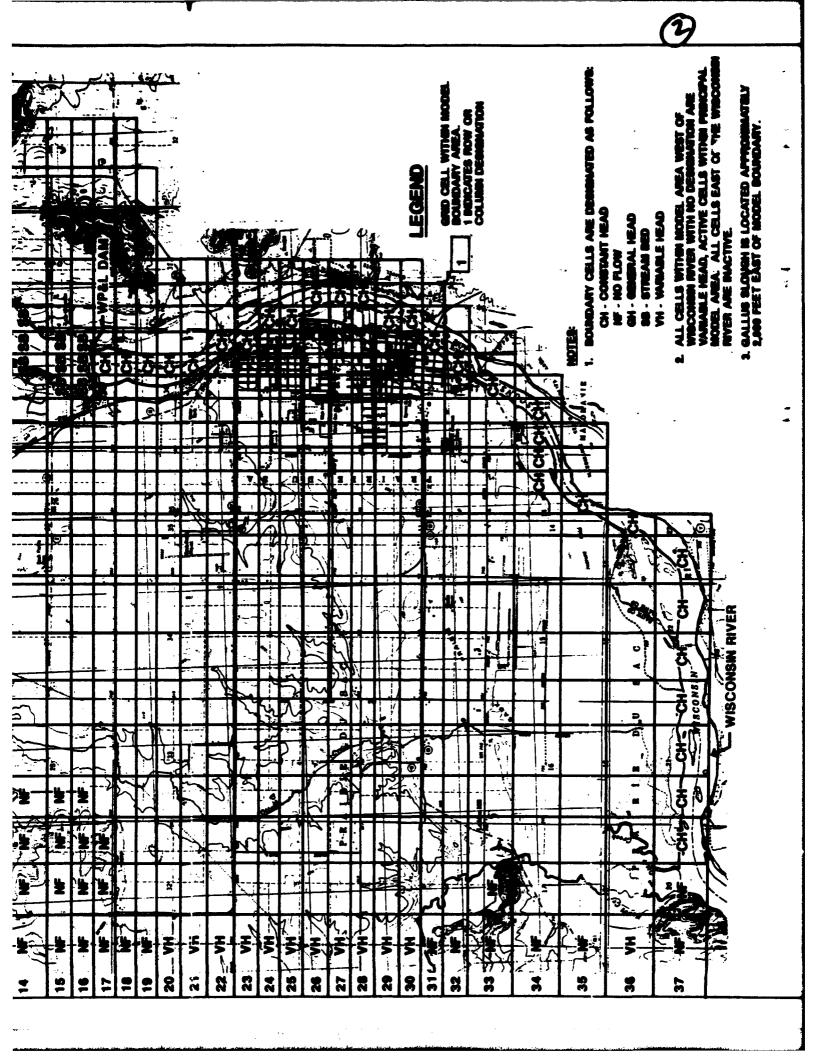


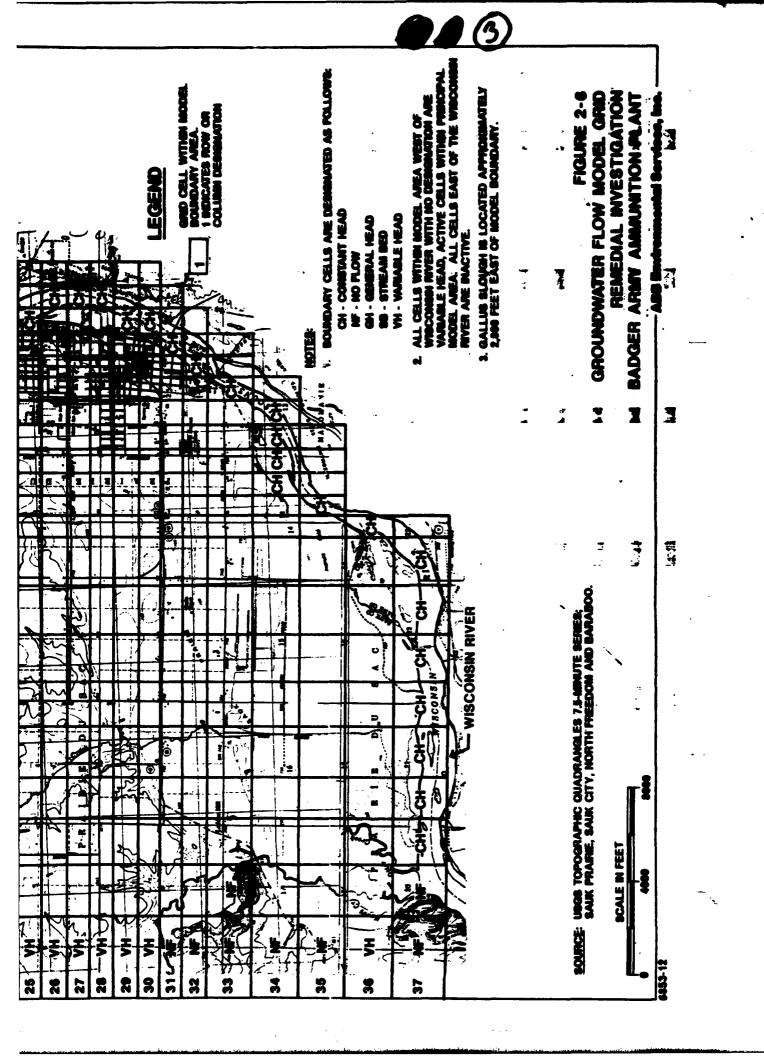


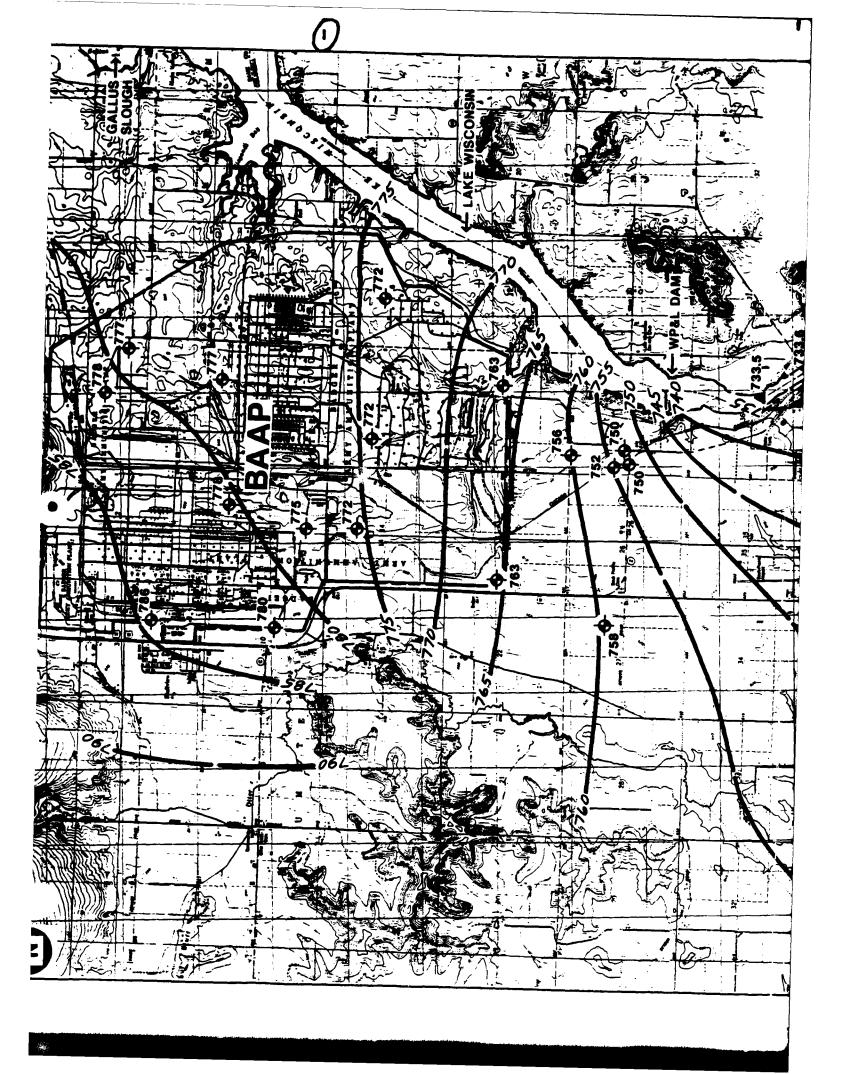


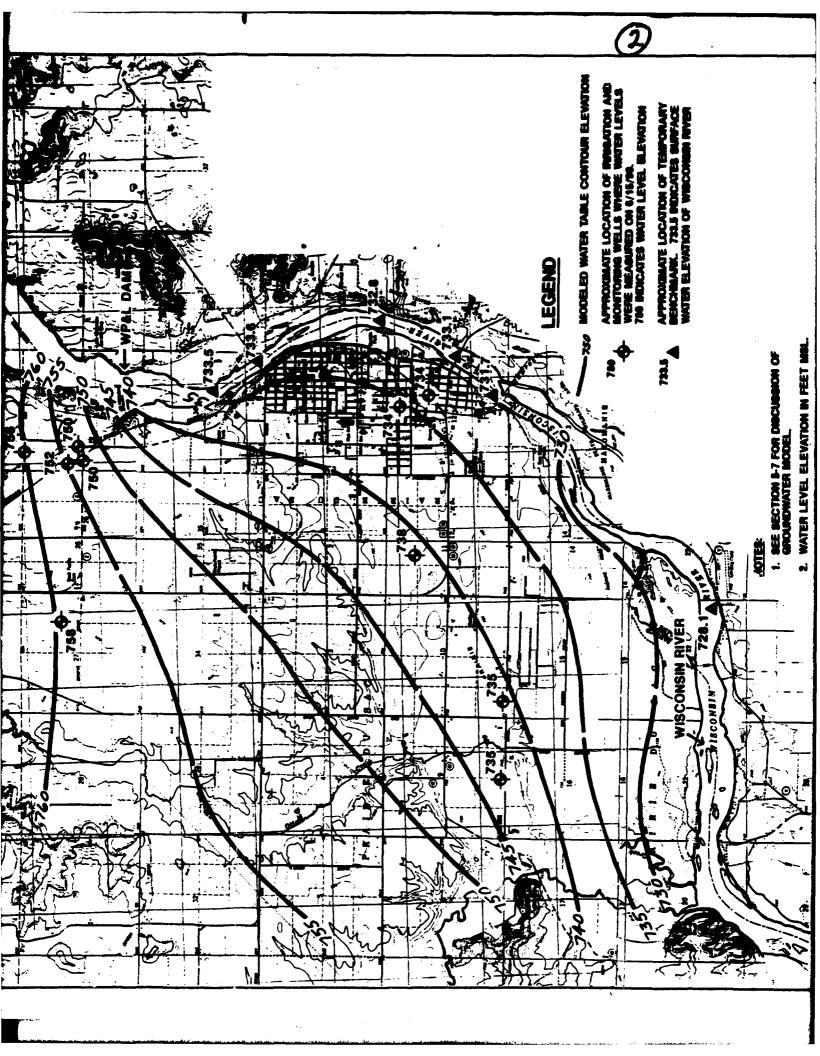


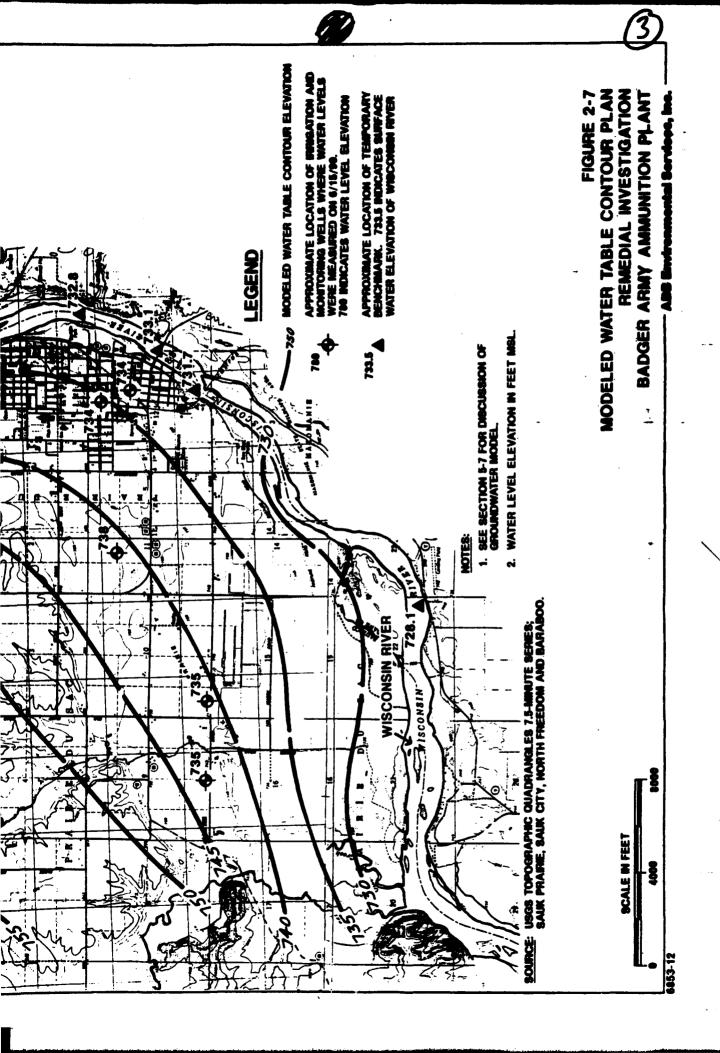


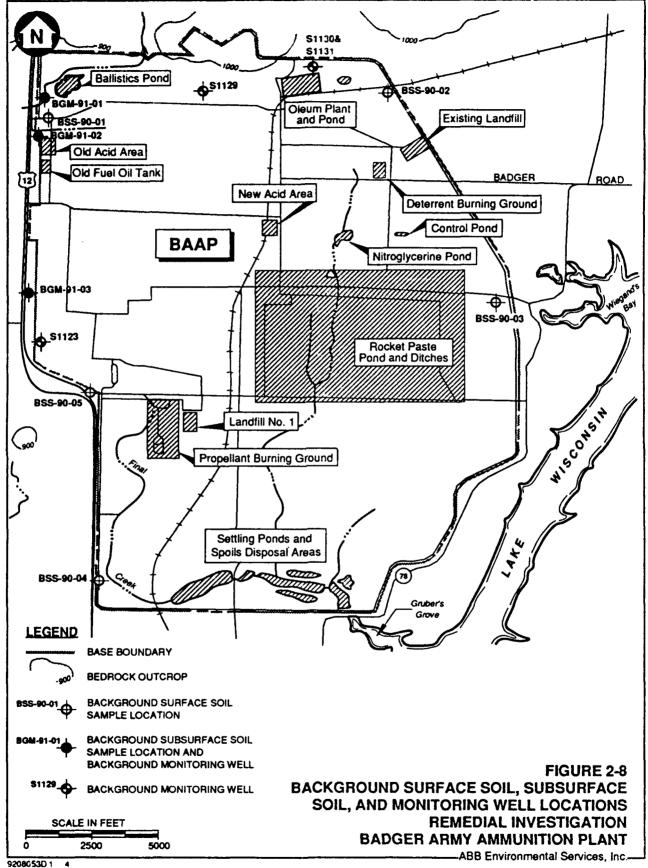












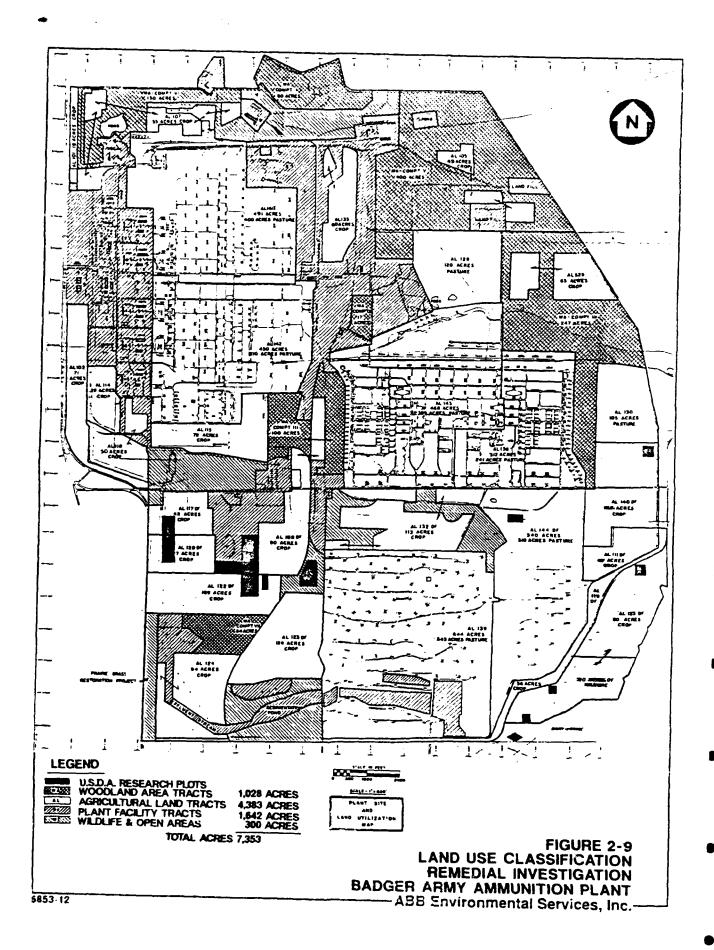


TABLE 3-1 CHECKLIST OF SWMU Environmental Setting and Features

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SWMU	WETLANDS	SURFACE WATER	SURFACE IMPOUNDMENT	LANDFILL	ABOVEGROUND STORAGE TANK
Propellant Burning Ground				Х	X (propane)
Deterrent Burning Ground				х	
Existing Landfill				Х	
Settling Ponds and Spoils Disposal Area	x	х	×	X	
Ballistics Pond	x	х			
Oleum Plant and Pond	x	Х			
Nitroglycerine Pond	×	Х			
Rocket Paste Area	X	Х			
Old Acid Area					X (acids)
New Acid Area			X		X (acids)
Old Fuel Oil Tank					X (fuel)

Note:

The landfill at the Propellant Burning Ground is known as Landfill 1, and is considered a separate SWMU.

SITE	POTENTIAL ARARS/CITATION
Propellant Burning Ground	LANDFILL
	Resource Conservation and Recovery Act (RCRA), Subpart N, Landfills; (40 CFR Section 264.300)
	WDNR, Solid Waste Management Regulations (WAC, Chapters 504-516)
	WDNR, Hazardous Waste Landfill Standards (WAC, Chapter 660)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR Part 52.21)
Deterrent Burning	LANDFILL
Ground	RCRA, Subpart N, Landfills; (40 CFR Section 264.300)
	WDNR, Solid Waste Management Regulations (WAC, Chapters 504-516)
	WDNR, Hazardous Waste Landfill Standards (WAC, Chapter 660)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)
Existing Landfill	LANDFILL
	RCRA, Subpart N, Landfills; (40 CFR Section 264.300)
	WDNR, Solid Waste Management Regulations (WAC, Chapters 504-516)
	WDNR, Hazardous Waste Landfill Standards (WAC, Chapter 660)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)

SITE	POTENTIAL ARARS/CITATION
Settling Ponds	WETLANDS
and Spoils Disposal Area	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)
	Clean Water Act (CWA), Dredge or Fill Requirements; (Section 404), 40 CFR 230
	U.S. Army Corps of Engineers Permit Program Regulations; (33 CFR Parts 320-330)
	Fish and Wildlife Coordination Act; (40 CFR 302(g))
	National Environmental Policy Act (NEPA) - Protection of Wetlands Exec. Order No. 11990: (40 CFR Part 6)
	WDNR, Water Quality Standards for Wetlands (WAC, Chapter NR 103)
	WDNR, City and Village Shoreland-Wetland Protection Program (WAC, Chapter NR 117)
	WDNR, Hazardous Waste Storage, Treatment, and Disposal Facility Standards (WAC, NR 630)
	SURFACE WATER
	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter NR 102)
	WDNR, Water Quality Standards for Wisconsin Waters; Uses and Designated Standards (WAC, Chapter NR 104)
	WDNR, Shoreline Management Program (WAC, Chapter 115)
	WDNR, Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements
	City of Baraboo Floodplain Zoning Code (Subchapter II)
	LANDFILL
	RCRA, Subpart N, Landfills; (40 CFR Section 264.300)
	WDNR, Solid Waste Management Regulations (WAC, Chapters 504-516)
	WDNR, Hazardous Waste Landfill Standards (WAC, Chapter 660)

SITE	POTENTIAL ARARS/CITATION
Ballistics Pond	WETLANDS
	Clean Water Act, Dredge or Fill Requirements; (Section 404), 40 CFR 230
	U.S. Army Corps of Engineers Permit Program Regulations; (33 CFR Parts 320-330)
	Fish and Wildlife Coordination Act; (40 CFR 302(g))
	NEPA - Protection of Wetlands Exec. Order No. 11990; (40 CFR Part 6)
	WDNR, Water Quality Standards for Wetlands (WAC, Chapter NR 103)
	WDNR, City and Village Shoreland-Wetland Protection Program (WAC, Chapter NR 117)
	WDNR, Hazardous Waste Storage, Treatment, and Disposal Facility Standards (WAC, NR 630)
	SURFACE WATER
	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter NR 102)
	WDNR, Water Quality Standards for Wisconsin Waters; Uses and Designated Standards (WAC, Chapter NR 104)
	WDNR, Shoreline Management Program (WAC, Chapter 115)
	WDNR, Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements
	City of Baraboo Floodplain Zoning Code (Subchapter II)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)

SITE	POTENTIAL ARARS/CITATION
Oleum Plant and Pond	WETLANDS
1 0112	Clean Water Act (CWA), Dredge or Fill Requirements; (Section 404), 40 CFR 230
	U.S. Army Corps of Engineers Permit Program Regulations; (33 CFR Parts 320-330)
	Fish and Wildlife Coordination Act; (40 CFR 302(g))
	NEPA - Protection of Wetlands Executive Order Number 11990; (40 CFR Part 6)
	WDNR, Water Quality Standards for Wetlands (WAC, Chapter NR 103)
	WDNR, City and Village Shoreland-Wetland Protection Program (WAC, Chapter NR 117)
	WDNR, Hazardous Waste Storage, Treatment, and Disposal Facility Standards (WAC, NR 630)
	SURFACE WATER .
	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter NR 102)
	WDNR, Water Quality Standards for Wisconsin Waters; Uses and Designated Standards (WAC. Chapter NR 104)
	WDNR, Shoreline Management Program (WAC, Chapter 115)
	WDNR, Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements
	City of Baraboo Floodplain Zoning Code (Subchapter II)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)

SITE	POTENTIAL ARARS/CITATION
Allenant	WETLANDS
Nitroglycerine Pond	Clean Water Act, Dredge or Fill Requirements; (Section 404), 40 CFR 230
	U.S. Army Corps of Engineers Permit Program Regulations; (33 CFR Parts 320-330)
	Fish and Wildlife Coordination Act; (40 CFR 302(g))
	NEPA - Protection of Wetlands Exec. Order No. 11990; (40 CFR Part 6)
	WDNR, Water Quality Standards for Wetlands (WAC, Chapter NR 103)
	WDNR, City and Village Shoreland-Wetland Protection Program (WAC, Chapter NR 117)
	WDNR, Hazardous Waste Storage, Treatment, and Disposal Facility Standards (WAC, NR 630)
	SURFACE WATER
	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter NR 102)
	WDNR, Water Quality Standards for Wisconsin Waters; Uses and Designated Standards (WAC, Chapter NR 104)
	WDNR, Shoreline Management Program (WAC, Chapter 115)
	WDNR, Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements
	City of Baraboo Floodplain Zoning Code (Subchapter II)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)

SITE	POTENTIAL ARARS/CITATION				
Rocket Paste Area	WETLANDS				
	Clean Water Act, Dredge or Fill Requirements; (Section 404), 40 CFR 230				
	U.S. Army Corps of Engineers Permit Program Regulations; (33 CFR Parts 320-330)				
	Fish and Wildlife Coordination Act; (40 CFR 302(g))				
	NEPA - Protection of Wetlands Exec. Order No. 11990; (40 CFR Part 6)				
	WDNR, Water Quality Standards for Wetlands (WAC, Chapter NR 103)				
	WDNR, City and Village Shoreland-Wetland Protection Program (WAC, Chapter NR 117)				
	WDNR, Hazardous Waste Storage, Treatment, and Disposal Facility Standards (WAC, NR 630)				
	SURFACE WATER				
	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter NR 102)				
	WDNR, Water Quality Standards for Wisconsin Waters; Uses and Designated Standards (WAC Chapter NR 104)				
	WDNR, Shoreline Management Program (WAC, Chapter 115)				
	WDNR, Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements				
	City of Baraboo Floodplain Zoning Code (Subchapter II)				
	AIR				
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)				
Old Acid Area	AIR				
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)				

SITE	POTENTIAL ARARS/CITATION
New Acid Area	SURFACE IMPOUNDMENT
	RCRA, Subpart K, Surface Impoundments; (40 CFR 264.220)
	WDNR, Solid Waste Management Regulations (WAC, Chapters 504-516)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)
Old Fuel Oil Tank	ABOVEGROUND STORAGE TANKS
	CWA - Oil Pollution Prevention (40 CFR Part 112)
	AIR
	Clean Air Act (CAA), Prevention of Significant Deterioration (PSD) Requirements; (40 CFR, Part 52.21)

SITE MEDIA	REQUIREMENT/CITATION
GROUNDWATER	
Federal Regulatory Requirements	Safe Water Drinking Act (SDWA), Maximum Contaminant Level Goals (MCLGs); (40 CFR Part 141)
	SDWA, National Primary Drinking Water Standards, Maximum Contaminant Levels (MCLs); (40 CFR Part 141)
	RCRA, Releases from Solid Waste Management Units, Groundwater Protection Standards; (40 CFR Part 264.90-264.101, Subpart F)
State Regulatory Requirements	WDNR, Environmental Protection (WAC, Chapter NR 100)
	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter 102.14)
	WDNR, Water Quality Criteria for Toxic Substances (WAC, Chapter 105)
	WDNR, Procedures for Calculating Water-quality-based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Water (WAC, Chapter NR 106)
	WDNR, Groundwater Quality Standards (WAC, Chapter 140)
	WDNR, Pollutant Discharge Elimination System Standards for Uncategorized Point Sources (WAC, Chapter 229.20)
	WDNR, Groundwater Standards for Hazardous Waste; Groundwater and Leachate Monitoring Standards and Corrective Action Requirements (WAC, Chapter 635)
Faderal Criteria, Advisories, and Guidance	Clean Water Act (CWA), Ambient Water Quality Criteria (AWQC); (40 CFR Part 131 Quality Criteria for Water, 1986)
	SDWA, National Secondary Drinking Water Standards (SMCLs); (40 CFR Part 143)
	EPA Reference Doses (RfDs)
	EPA Reference Concentrations (RfCs)
·	EPA Human Health Assessment Cancer Slope Factors (CSFs)
	EPA Office of Drinking Water, Health Advisories
	EPA Health Assessment Documents, Acceptable Intake - Chronic (AIC) and Subchronic (AIS)
	EPA, Office of Water Guidance. Water-Related Fate of 129 Priority Pollutants (1979)

SITE MEDIA	REQUIREMENT/CITATION
SURFACE WATER	
Federal Regulatory Requirements	CWA, National Pollutant Discharge Elimination System (NPDES); (40 CFR Part 122, 125)
	CWA. Ambient Water Quality Criteria (AWQC); (40 CFR Part 131 Quality Criteria for Water, 1986)
State Regulatory Requirements	WDNR, Water Quality Standards for Wisconsin Waters (WAC, Chapter 102.14)
	WDNR, Water Quality Criteria for Toxic Substances (WAC, Chapter 105)
	WDNR, Procedures for Calculating Water-quality-based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Water (WAC, Chapter NR 106)
	WDNR, Pollutant Discharge Elimination System Standards for Uncategorized Point Sources (WAC, Chapter 220.20)
Discharge to Publicly Owned Treatment Works	CWA, National Pretreatment Standards; (40 CFR Part 403) Discharge to Publicly Owned Treatment Works
SOIL	Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites; [OSWER Directive #9355.4-02]
SEDIMENT	No chemical-specific ARARs identified for this media.
AIR	
Federal Regulatory Requirements	Clean Air Act (CAA), National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50)
	CAA - National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR 61)
	CAA - Hazardous Air Pollutants (HAPs) (CAA, Title III)
State Regulatory Requirements	WNDR; Wisconsin General and Portable Sources Air Pollution Control Rules; Ambient Air Quality Standards (WAC, Chapter NR 404)
	WNDR; Wisconsin Particulate and Sulfur Emissions Rules; Control of Particulate Emissions (WAC, Chapter NR 415)
	WNDR; Wisconsin Organic Compound Emissions Rules (WAC, Chapter NR 419)
	WDNR; Wisconsin Hazardous Air Pollutants Emissions Standards (WAC, Chapter NR 445)

TABLE 3-4
GROUNDWATER CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITIONS PLANT

		·			CWA WATER OU	CWA WATER QUALITY CRITERIA (c)					
3	CHEMICAL	SAFE DRINKING WATER ACT (SDWA) (d)	WATER ACT	FOR PROTECTION OF HUMAN HEALTH	HUMAN HEALTH	FOR PROTECTION	FOR PROTECTION OF AQUATIC LIFE	WI PUBLIC HEALTH GROUNDWATER QUALITY STANDARDS (b)	GROUNDWA	TER QUALITY STAM	DARDS (b)
				WATER AND FIRH	FISH CONSUMPTION	FRESHWATER	MARWE	CURRENT STANDARDS	ARDS	PROPOSED STANDANDS	NDARD\$
CODE	CHEMCAL NAME	MCL (vgA) (s)	MCLG (vg/l)	CONSUMPTION (ug/l)	ONLY (vgA)	ACUTE/CHRONIC (Mg/l)	ACUTE/CHRONC (UB/I)	ENFORCEMENT STANDANDS (PGA)	PAL (vg/l)	ENFONCEMENT STANDARDS (URA)	PAL
ACRYLO	acrylonitrile		·	0.058	0.65	7,500/2,600 (10)	-/-				·
4L	aluminum	50-200 (1)		(2)	(2)	(2)	(2)	•			
ALK	alkalinity	,	•	-	•	- /20 ppm	4	_			·
AS	arsenic	50 (3)	٠	0.0022	0.0175	4	4	90	2		
вгенр	bis(2 ethylhexyl) phthalate	4 (4)	0	15.000	000'05	400/300 (4)	400/360 (4)	8	6.9	•	
БА	bartum	2,000	2,000	1,000		4	+	1,000	200	2,000	007
CZHANL	vinyt chloride	2	0	2	525	./.	4-	0.2	0.0015		70°0
فالقن	benzene	'n	0	0.66	40	5,300/- (5)	5,100/700 (5)	S	0.067	,	5:
5	catclum	,		,		4	-1-			٠	
6.124	carbon tetrachloride	w	0	0.4	6.94	35,200/· (5)	50,000/- (5)	ş	0.5		
c.D	cadmium	S	2	10	,	3.9/1.1 (4)	43/9.3	10	1	5	9.0
CHCL3	chloroform	100 (6)		0.19	15.7	28,900/1,240(5)	-1-	9	9:0		
CI	chloride	250,000 (7)				860,000/230,000	. / -	250,000 (7)	125,000		
CO	cobaft	,		·		4-	+	-			
Ε,	chromium (total)	100	100	,		+-	4.	50	5	100	10
73.	carbon disulfide	,		·	·	4.	4		,		
12Dr 1 E	1,2-dichloroethane	S	0	0.94	243	118,000/20,000 (5)	11,300/- (5)	5	0.05		3.0
3 2	diethylphthalate	,		350,000	1,900,000	-†-	+	-			
Jane	di o butyi phthalate	,		34,000	154,000		-/-		·		

W0039213.T3/11

TABLE 3-4 GROUNDWATER CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

					CWA WATER QU	CWA WATER QUALITY CRITERIA (c)					
S	CHEMICAL	SAFE DRINKING WATER ACT (SDWA) (d)	WATER ACT	FOR PROTECTION OF HUMAN HEALTH	HUMAN HEALTH	FOR PROTECTION	FOR PROTECTION OF AQUATIC LIFE	WI PUBLIC HEALTH GROUNDWATER QUALITY STANDANDS (b)	GROUNDWA	TER QUALITY STAM	DAMDS (b)
				WATER AND FISH	FISH CONSUMPTION	FRESHWATER	MARNE	CURRENT STANDARDS	DARDS	PROPOSED STANDANDS	MDARDS
CODE	CHEMICAL NAME	MCL (wg/l) (a)	MCLG (vg/l)	CONSUMPTION (µg/l)	ONEY (µg/l)	Acute/Chronic (ug/l)	ACUTE/CHRONIC (µg/l)	ENFONCEMENT STANDANDS (Jug/l)	PAL (wg/l)	EMFONCEMENT STANDANDS (µgA)	PAL (way)
GNOP	di-n-octyl phthalate			•		+	-/-				
1 M 142	2,4-dinitrotoluene			0.11	9.1	330/230 (5)	4.	0.05	0.005	•	
26DNT	2,6-dinitrotoluene	٠		•	•	4-	4.	0.05	0.005	•	
, ANT	fluoroanthene			42	54	3,980/- (5)	40/16 (5)				·
16	ron	300 (1)	·	300		17.	4.	300 (7)	150 (7)	•	
наво	hardness	•		٠	•	4-	4-	-			
HG	mercury	2	2	0.144	0.146	2.4/0.012	2.1/0.025	2	0.2		
MEC6H5	toluene	1,000	1,000	14,300	424,000	17,500/- (5)	6,300/5000 (5)	343	9:89	40 (8)	20 (6)
MEK	2-butanone		,			+-	-/-	460	06	•	
f.siv	manganese	50 (1)	200 (4)	50	100	-/-	4-	(2) 05	25 (7)	,	
MINAP	2- methylnaphthalene	·				4.	·/-	,		•	
7.PA	sodium	(6)	,		,	4-	-/-	•			
NANIL	2 nitroanline					4.	./-	·	·		,
SNATH	3-nitrcanlline	·	·			+	4.	,			,
4MAF4II.	4 nitroaniline		·		,	+	-/-	,			
HAP	naphthalene	٠	,		·	2,300/620 (5)	2,350/-	40	8		,
118	nitrobenzene		·	19,800	·	27,000/- (5)	6,680/- (5)	•			,
(16	nitroglycerine			·		-†-	/-				

TABLE 3-4 GROUNDWATER CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

SO 250,000 (7) 250 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5			,			CWA WATER QU	CWA WATER QUALITY CRITERIA (c)					
Chesistrat, Name MaCL MaCL MaCL Consequent noise Consequen	S	HEMCAL	SAFE DRINKING (SDWA	WATER ACT	FOR PROTECTION OF	HUMAN HEALTH	FOR PROTECTION	OF AQUATIC LIFE	WI PUBLIC HEALTH	GROUNDWA	TER QUALITY STAN	DAADS (b)
Chesistat Maine Cumple C			3	3	WATER AND FISH	FISH CONSUMPTION	FREBHWATER	MARHE	CUMBET STAN	DAROS	PROPOSED STANDANDS	NDANDS
Inches 100 100 134 100 1400160 (10) 75,6.3 Fig. 200 Fig. 2000 (11) 10,000 (11) Fig. 2000 (12) Fig. 2000 (12) Fig. 2000 (12) Fig. 2000 (12) Fig. 2000 (13) Fig. 20	CODE	CHEMICAL NAME	(m) (µBrr)	(vay)	Corecour Trois (vg/l)	(MgA)	ACUTE/CHROINC (Mg/l)	ACUTE/CHRONIC (PG/I)	ENFORCEMBIT STANDARDS (AgA)	PAL	ENFORCEMENT STANDANDS (JugA)	P AL
In printicate nontypecific nontypecific 10,000 (11) 10,000 (11) (12) 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Z	nickel	100	100	13.4	100	1,400/160 (10)	75/8.3	٠	·		
In thritos Thintos (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12) (12)	NIT	nitrite/nitrate- nonspecific	10,000 (11)	(11) 000'01	,	•	+	+	10,000	2,000		
intrate 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 1,000 <	NNDPA	n-nitros diphenylamine			(12)	(12)	÷	<i>+</i>				
lead TT (3) 0 50 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10 220,005 10 250,000 (1) 10,000 10,000 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	rt02	ntrite	1,000	1,000	1		+	-/-			1000	290
lead TT (3) 0 50 50 63,3.2 (10) 220/6.5 50 50 setenlum 50 50 10 10 0.020.005 0.30.077 10 sulfate 250,000 (1) 400/500 (4) 10 10 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 1.030.000 <td< td=""><td>NO3</td><td>nitrate</td><td>10,000</td><td>10,000</td><td>10,000</td><td></td><td>4</td><td>÷</td><td></td><td></td><td>10,000</td><td>2,000</td></td<>	NO3	nitrate	10,000	10,000	10,000		4	÷			10,000	2,000
selenium 50 10 10 0.02/0.005 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	5	lead	т (3)	0	50	•	83/3.2 (10)	220/8.5	ક્ક	s	15	5.
sulfate 250,000 (1) 400/500 (4) 400/500 (4) · · · · · · · · · · · · · · · · · · ·	SE	setenium	S	20	10		0.02/0.005	0.3/0.071	01	-	\$0	10
1.1.2- trichloroethane 5 3 0.6 41.8 79.400 (5) 7- 31.200-(5) 200 1.1.2- trichloroethane 500,000 (14) 3 0.6 41.8 -/9.400 (5) -/- 0.6 N 2.3.6- trichloroethylaethalene 5 0 2.7 60.7 45,000/21,000 (5) 2,000/5) 5	SO4	suffate	250,000 (1) 400/500 (4)	400/500 (4)	·		<i>÷</i>	<i>.</i>	250,000 (7)	125,000		,
1.1.2- trichloroethane 5 3 0.6 41.8 -/9.400 (5) -/- 0.6 1.1.2- trichloroethylapthalene 500,000 (14) - -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/-	111TCE	1,1,1- trichloroethane	200	200	18400	1,030,000	+	31,200/- (5)	500	40		
total dissolved sollds 500,000 (14) -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/- -/-	112TCE	1.1.2- trichloroethane	s	3	9:0	41.8	-/9,400 (5)	+	9.0	90.0		
V 2.3.6: -/- -/- -/- trimethylnapthalene 5 0 2.7 80.7 45,000/21,000 (5) 2,000/- (5) 5	105	total dissolved solids	500,000 (14)			,	+	+			,	
frichloroethylene 5 0 2.7 80.7 45,000/21,000 (5) 2,000/- (5) 5	236TMN	2,3,6. trimethylnapthalene	·		•		+	-/-				
	TACLE	trichloroethylene	5	0	2.7	80.7	45,000/21,000 (5)	2,000/- (5)	S	0.18		0.5

TABLE 3-4 GROUNDWATER CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

					CWA WATER QU	CWA WATER QUALITY CRITERIA (c)					
	CHEMICAL	SAFE DRINKING WATER ACT (SDWA) (d)	WATER ACT	FOR PROTECTION OF HUMAN HEALTH	HUMAN HEALTH	FOR PROTECTK	FOR PROTECTION OF AQUATIC LIFE	WI PUBLIC HEALTH	GROUNDWA.	WI PUBLIC HEALTH GROUNDWATER QUALITY STANDANDS (b)	AMOS (b)
				WATER AND FISH	FISH CONSUMPTION	FREGHWATER	MARINE	CUMBNT STANDARDS	DARDS	PROPOGED STANDANDS	DANDS
CODE	CHEMICAL NAME	MCL (wg/l) (a)	MCLG (vg/l)	CONSUMPTION (µg/l)	ONEY (Ug/l)	ACUTE/CHRONIC (Mg/l)	Acute/Cirronic (vg/l)	EMFONCEMENT STANDANDS (#g/l)	PAL (vgA)	ENFORCEMENT STANDANDS (µg/l)	PAL (eq.)
N7	Zinc	5000 (1)	·	,	,	102/110 (10)	95/86 (10)	5,000 (7)	2,500	·	
Snurces:											
(9)	U.S. Environmental Pro	otection Agency (EPA	4), 1991, "Fact	U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards" Office of Water Waterbrands D. A. A. Standards" Office of Water Waterbrands D. A. Standards"	Drinking Water	(c)	EPA, 1991. "Water Quality Criteria Summary": Office of Science and Technology, Health and Ecological Criteria Division, Ecological Risk Assessment Branch, Human Risk Assessment Branch; Washington, D C	teria Summary"; Office of sk Assessment Branch, Hu	of Science and uman Risk Ass	Technology, Health and essment Branch; Wash	d Ecological lington, D.C.
(9)	Secondary Drinking Water Standards", Office of Water, Wasingson, D.C., August, Mass 1990, "National Primary and Secondary Drinking Water Regulatory Chemicals, Final Rule", 57FR31776, July 17, 1992. Wisconsin Administrative Code, Chapter NR 140, 10, Table 1.	vater, washington, ater Standards", Offici ing and Secondary Drin final Rule", 57FR31776 live Code, Chapter NR	D.C. August, 13 e of Water, Wash nking Water Regr. 5, July 17, 1992. 140.10, Table 1.	entingues. Our en water, washington, D.C., August, 1997; EPA, 1997, "Tact Direct: National Secondary Drinking Water Standards", Office of Water, Washington, D.C., September, 1991; and EPA, 1990, "National Prinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals and Inorganic Synthetic Organic Chemicals and Wisconsin Administrative Code, Chapter NR 140, 10, Table 1.	Sheet: National 1991; and EPA, c Chemicals and	(d) EP	May 1, 1991. EPA SDWA National Primary Drinking Water Regulations per 40 CFR 141: MCLs and MCLGs.	Orinking Water Regulation	ns per 40 CFR	141: MCLs and MCLC	s,
Notes:											
€	Secondary drinking water standards, suggested level	iter standards, sugges	sted level			(8) YG	WDNR proposes to delete toluene from regulation as a public health water quality standard and to promuloate a public welfare water results standard	oluene from regulation as	s a public hea	atth water quality stan.	dard and to
Q 6	Criteria are pH dependent. Refer to 53FR33178.	lent. Refer to 53FR331	178.			ON (6)	No MCL has been set for sodium. However, a reporting level of 20,000 µg/l has been established as the	um. However, a reporting	g level of 20,00	X) µg/f has been establi	shed as the
<u> </u>	Mrc. for disease currently under review. Proposed value.	iny under review.				re.	reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet.	required and data is repo	orted to health	n officials to protect inc	awduals on
<u>@</u> (Insufficient data to deve	relop criteria. Value pr	resented is the lo	insufficient data to develop criteria. Value presented is the lowest observed effect level	''	(10) Ha	Hardness dependent criteria (100 mg/l CaCO3 used).	(100 mg/l CaCO ₃ used).			
<u>o</u>	Standard indicated is propose value for bromodichloromethane, and bromoform).	propose value for to e, and bromoform).	otai trinaiometha	otandara indicated is propose value for total trinalomethanes (i.e., chloroform, dibromomethane, bromodichloromethane, and bromoform).	bromomethane,		Standard Indicated is for total nitrite/nitrate. Although no published criteria exist, values for NNDPA have been reformated using 1918. Bedough 8 2000 a	nitrite/nitrate. exist_values for NNOPA t	Sec need over	shad Aldienish baseling	S Care
6	Values are for protectly	ion of public welfare ((usually aesthetic	Values are for protection of public welfare (usually aesthetic concerns) rather than for protection of	or protection of	•					3
	poolic neami, rubiic w	renare standards may	not be enforced	pudiik, frequiti, in fubiik, wellate standatus may not be enforced as rigorously as publik health standards.	ealth standards.	(13) Tre	Treatment technique requirement in effect. The Preventative Action Limit for total discolued solide. (TDS) is 500 000, and about an acception.	ent in effect. For total discolved soliv	de CEDST is 20	\$ \$500 QC	4
							background concentration; there is no Enforcement Standard for TDS.	here is no Enforcement S	standard for TE	or, ood py: abov: aii - 35.	finishtanta
Agromyma:											
CWA	Clean Water Act					1/ 6/4	micrograms per liter, equivalent to parts per billion	nt to parts per billion			
FPA IRIS	United States Environmental Profection Agency Integrated Risk Information System	nental Profection Agen ition System	you				milligrams per liter, equivalent to parts per million	to parts per million			
MCL	Maximum Contaminant Level	Level				⋖	Safe Water Drinking Act				
MCLG	Maximum Contaminant level Goal	level Goal					Total Dissolved Schds				
						WONH	Wisconsin Department of Natural Resources	ural Resources			

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTION-SPECIFIC ARAI	POTENTIAL ACTION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	HATIVES
OTHER RESPONSE ACTIVITIES	CITATION	REQUIREMENTS	CONSIDERATIONS
All Hazardous Waste TSD Units	RCRA, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; (40 CFR Part 264)	Establishes minimum national standards which define the acceptable management of hazardous wastes for owners and operators of facilities which treat, store or dispose of hazardous wastes.	Should remedial actions involve management of RCRA wastes at an offsite TSDF or if a treatment facility is constructed on-site, these requirements would be applicable.
	RCRA, General Facility Standards; (40 CFR Subpart B, 264.10-264.18)	General facility requirements outline general waste analysis, security measures, inspections, and training requirements.	Should remedial actions involve management of RCRA wastes at an off-site TSDF or if a treatment facility is constructed on-site, these requirements would be applicable.
	RCRA, Preparedness and Prevention; (40 CFR Subpart C, 264.30-264.37)	This regulation outlines requirements for safety equipment and spill-control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Safety and communication equipment should be incorporated into all aspects of the remedial process and local authorities should be familiarized with site operations.
	RCRA, Contingency Plan and Emergency Procedures; (40 CFR Subpart D, 264.30-264.37)	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	These requirements are relevant and appropriate for remedial actions involving the management of hazardous waste.

	POTENTIAL ACTION-SPECIFIC ARA	POTENTIAL ACTION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	NATIVES
OTHER RESPONSE ACTIVITIES	CITATION	REQUIREMENTS	CONSIDERATIONS
	RCRA, Releases from Solid Waste Management Units; (Subpart F, 264.90-264.109)	The scope of the regulation encompasses: groundwater protection standards; concentration limits; point of compliance; compliance period; requirements for groundwater monitoring, detection monitoring, and compliance monitoring; and compliance monitoring; and the corrective action program. Provides guidelines for the remediation of solld waste management units including: establishes specific groundwater monitoring requirements, sets MCLs as level of compliance for upper aquifer, and establishes requirements of the corrective action program.	Applicable to remedial alternatives that involve the closure and post-closure of SWMUs because BAAP holds a RCRA Part B Permit.
	RCRA, Hazardous Waste Permit Program; (40 CFR Part 270)	Establishes provisions covering basic EPA permitting requirements.	RCRA permitting requirements need to be determined on a case-by-case basis, working with all involved regulatory agencies. However, any activity involving the treatment or containment of hazardous waster's subject to these permitting requirements.
Hazardous Waste Transportation	DOT Rule for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-172.558)	Outlines procedures for the packaging, labeling, manifesting, and transportation of hazardous materials.	This regulation will be applicable to any company contracted to transport hazardous wastes from the site.

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTION-SPECIFIC ARA	POTENTIAL ACTION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	VATIVES
OTHER RESPONSE ACTIVITIES	CITATION	REQUIREMENTS	CONSIDERATIONS
	Standards Applicable to Transporter of Hazardous Waste, RCRA Section 3003, 40 CFR 170 - 179.	Establishes the responsibility of off-site transporters of hazardous waste in the handling, transportation, and management of the waste. Requires a manifest, recordkeeping, and immediate action in the event of a discharge of hazardous waste.	This regulations will be applicable to any company contracted to transport hazardous material from the site.
Countral of Air Emissions	CAA - New Source Performance Standards; 40 CFR 60	Establish emission ilmits for a number of different pollutants for certain classes of new stationary sources. Include limits for fluorides, sulfuric acid mist, and total reduced sulfur.	These provisions are generally not applicable to cleanup actions. However, if a facility is a new source subject to a NSPS (such as an incinerator), the requirement may be applicable. If the pollutants emitted and the technology employed is similar to the pollutant and source category regulated, the NSPS may be considered relevant and approjuriate
	WDNR, General and Portable Sources Air Pollution Control Rules; Ambient Air Quality Standards (WAC, Chapter NR 404)	Primary and secondary amblent air quality standards for sulfur oxides, suspended particulated, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter are established in this rule. The primary air standard provides protection for the public health with a margin of safety. The secondary air standard is the level of air quality that may be necessary to protect public welfare from unknown or anticipated adverse effects.	Potential applicable requirements for off- site TSD units. Potential Relevant and appropriate requirements for on-site TSD units.

OTHER RESPONSE ACTIVITIES			
	CITATION	REQUIREMENTS	CONSIDERATIONS
WDNR, and Sul Control (WAC, (WAC,)	WDNR, Wisconsin Particulate and Sulfur Emissions Rules, Control of Particulate Emissions (WAC, Chapter NR 415)	This rule requires that precautions be taken to prevent particulate matter from beconning airborne. Particulate emission limits for certain processes are specified, and a default value of 0.4 Lbs of particulate matter per 1,000 pounds of gas is established for any process not listed in Section 415.05. Particulate emission limits for fuelburning equipment and incinerators are established.	Potential applicable requirements for offsite TSD units. Potential Relevant and appropriate requirements for on-site TSD units.
WDNR, Emission NR 419)	WDNR, Organic Compound Emission Rules (WAC, Chapter NR 419)	The rule states that no more than 5.7 liters of any liquid volatile organic compound (VOC) waste or any liquid, semisolid, or solid material containing more than 5.7 liters of any VOC may not be disposed of in one day's time from a facility in a manner which would permit evaporation into the ambient air during ozone season. The quantity of VOCs that evaporate into the ambient air during the ozone season must not exceed 15% (by weight) or 5.7 liters in any one day, whichever is larger.	Potential applicable requirements for off- ske TSD units. Potential Relevant and appropriate requirements for on site 1SD units.
WDNR, Lead, a Rules (WDNR, Wisconsin Carbon, Lead, and Nitrogen Emission Rules (WAC, Chapters 426-428)	These rules establish emission rules for carbon, lead, and nitrogen.	Potential applicable requirements for off- site TSD units. Potential Relevant and appropriate requirements for on site TSD units.

continued

TABLE 3-5 POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTION-SPECIFIC ARAI	POTENTIAL ACTION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	NATIVES
OTHER RESPONSE ACTIVITIES	CITATION	REQUIREMENTS	CONSIDERATIONS
	WDNR, Hazardous Air Pollutants Emissions Standards (WAC, Chapter NR 445)	Establishes acceptable emission rates for hazardous air contaminants, which are defined as contaminants for which no ambient air quality standard is set in Chapter NR 404 and which may cause or significantly contribute to inortality or a serious irreversible illness, or may pose a significant threat or public health or the environment.	Potential applicable requirements for offsite TSD units. Potential Relevant and appropriate requirements for on-site TSD units.
Excavation	CAA - NAAQS for Total Suspended Solids (40 CFR 129.105, 750).	This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter. Fugitive dust emissions from site excavation activities must be maintained below 260 µg/m³ (primary standard).	Proper dust suppression methods must be implemented.
	CAA - NAAQS (40 CFR 50)	Provides Air Quality Standards for particulate matter and lead.	Fugitive dust emissions must be controled during construction to maintain concentrations below these levels.
	RCRA - 40 CFR 264	Requires owner/operator to control wind dispersal of particulate matter.	Same as above.

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ERNATIVES	CONSIDERATIONS	Same as above	Same as above.
ION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	REQUIREMENTS	Primary and secondary ambient air quality standards for sulfur oxides, suspended particulated, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter are established in this rule. The primary air standard provides protection for the public health with a margin of safety. The secondary air standard is the level of air quality that may be necessary to protect public welfare from unknown or anticipated adverse effects.	This rule requires that precautions be taken to prevent particulate matter from becoming airborne. Particulate emission limits for certain processes are specified, and a default value of 0.4 Lbs of particulate matter per 1,000 pounds of gas is established for any process not listed in Section 415.05. Particulate emission limits for fuel-burning equipment and incinerators are established.
POTENTIAL ACTION-SPECIFIC ARARS COMMON TO	CITATION	WDNR, General and Portable Sources Air Pollution Control Rules; Ambient Air Quality Standards (WAC, Chapter NR 404)	WDNR, Wisconsin Particulate and Sulfur Emissions Rules, Control of Particulate Emissions (WAC, Chapter NR 415)
	OTHER RESPONSE ACTIVITIES		

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTION-SPECIFIC ARAI	ON-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	LATIVES
THER RESPONSE ACTIVITIES	CITATION	Requirements	CONSIDERATIONS
	WDNR, Organic Compound Emission Rules (WAC, Chapter NR 419)	The rule states that no more than 5.7 ifters of any liquid volatile organic compound (VOC) waste or any liquid, semisolid, or solid material containing more than 5.7 liters of any VOC may not be disposed of in one day's time from a facility in a manner which would permit evaporation into the ambient air during ozone season. The quantity of VOCs that evaporate into the ambient air during the ozone season must not exceed 15% (by weight) or 5.7 liters in any one day, whichever is larger.	Same as above.
	WDNR, Wisconsin Carbon, Lead, and Nitrogen Emission Rules (WAC, Chapters 426-428)	These rules establish emission rules for carbon, lead, and nitrogen. Same as above.	
	WDNR, Hazardous Air Pollutants Emissions Standards (WAC, Chapter NR 445)	Establishes acceptable emission rates for hazardous air contaminants, which are defined as contaminants for which no ambient air quality standard is set in Chapter NR 404 and which may cause or significantly contribute to mortality or a serious irreversible illness, or may pose a significant threat or public health or the environment.	Same as above.

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTION-SPECIFIC ARA	POTENTIAL ACTION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	NATIVES
OTHER RESPONSE ACTIVITIES	CITATION	REQUIREMENTS	CONSIDERATIONS
Land Disposal	RCRA, Land Disposal Restrictions; (40 CFR Part 268)	Land disposal of RCRA hazardous wastes without prior treatment is prohibited. Waste at specific sites must be evaluated as to whether it meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility.	Under the LDRs, treatment standards have been established for all listed wastes. If it is determined that hazardous wastes at BAAP are subject to LDRs, these requirements will be potential relevant and appropriate requirements for on-site disposal and applicable requirements for off-site disposal.
	RCRA, Identification and Listing of Hazardous Waste; (40 CFR Part 261, 261.1-261.33)	Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265.	Applicability of RCRA regulations to wastes found at the site is dependent on the solid waste meeting one of the following criteria: a. Generated through a RCRA listed source process. b. RCRA listed waste from nonspecific source. c. Characteristically hazardous due to ignitability, corrostivity,

TABLE 3-5 POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTION-SPECIFIC ARA	POTENTIAL ACTION-SPECIFIC ARARS COMMON TO A VARIETY OF REMEDIAL ALTERNATIVES	IATIVES
OTHER RESPONSE ACTIVITIES	CITATION	REQUIREMENTS	CONSIDERATIONS
Worker Protection	Occupational Health and Safety Act (OSHA), Health and Safety Standards; (29 CFR Part 1926)	This regulation specifies the type of satety training, equipment, and procedures to be followed during site investigation and remediation.	All phases of the remedial response project at BAAP should be executed in compliance with this regulation.
	OSHA, General Industry Standards; (29 CFR Part 1910)	Regulates worker health and safety at hazardous waste sites (i.e., specifies 8-hour time-weighted average concentration for various organics compounds). Training requirements for workers at hazardous waste operations are specified in 29 CFR Part 1910.120.	Under 40 CFR 300.38, requirements of the Act apply to all response activities under the NCP. Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below the specified concentration. Workers performing site work are required to have completed specific training requirements.
	OSHA, Recordkeeping. Reporting, and Related Regulations; (29 CFR Part 1904)	This regulation outlines the recordkeeping and reporting requirements to be followed during on-site remedial activities.	These requirements apply to all site contractors and subcontractors, and must be followed during all site work.

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTIO	N-SPECIFIC ARARS FOR SOIL	POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESURIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Containment by Capping	Low-permeability cover is constructed over the site to provide a barrier to water infiltration and/or prevent direct contact and ingestion hazards associated with contaminated soil surfaces.	RCRA, 40 CFR 264.117(c)	Restrict post-closure use of property as necessary to prevent damage to the cover.	Because capping would not include placement of hazardous waste into another unit, this requirement is a potential applicable ARAR. Where "placement" occurs, the requirement is potentially relevant and appropriate.
		WNDR, Hazardous Waste Disposal Landfill Cap Standards; Chapter 660.15.	Specification for a final cover for hazardous waste landfills or surface impoundments which have operated without an operating license are established in this chapter.	These requirements are potential relevant and appropriate requirements for a capping system.
Excavation and Disposal in On-Site Landfill	Excavate and dispose soils which are not regulated by RCRA LDRs in a secure on-site landfill constructed for that purpose.	RCRA, Landfills; (Subpar N, 264.300-261.339)	This regulation details the design, operation, monitoring, inspection, recordkeeping, closure, and permit requirements for a RCRA landfill.	For on-site disposal, these regulations are relevant and appropriate in order ensure adequate long-term land-based management of hazardous materials. For containment oriented alternatives, the construction of caps using RCRA design and performance standards criteria may be warranted.

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTIO	IN-SPECIFIC ARARS FOR SOIL	POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
		Wisconsin Hazardous Waste Landfill Standards: Landfill and Surface Impoundment Standards. (WDNR, Chapter NR 660)	This chapter establishes the requirements for initial site inspection and report, feasibility report, plan of operation, and minimum design requirements for landfills and surface impoundments.	This chapter applies to owners and operators of facilities that treat, store, or dispose of hazardous waste in landfills or surface impoundments.
		Also, see all requirements li	Also, see all requirements listed under "Excavation", and "All Hazardous Waste TSD Units".	is Waste TSD Units".
Excavation and Disposal in Off-Site	Excavate and hauf soll not regulated by LDRs to a secure, existing landfill.	RCRA, Landfills; (Subpart N, 264.301)	This regulation details the design, operation, monitoring, inspection, recordkeeping, closure, and permit requirements for a RCRA landfill.	For off-site disposal, these regulations are applicable requirements for the owners or operators of a Subtitle C landfill
		Chapter NR 660; Wisconsin Hazardous Waste Landfill Standards: Landfill and Surface Impoundment Standards	This chapter establishes the requirements for initial site inspection and report, feasibility report, plan of operation, and minimum design requirements for landfills and surface impoundments.	This chapter applies to owners and operators of facilities that treat, store, or dispose of hazardous waste in landfills or surface impoundments.
		Also, see all regulations liste	Also, see all regulations listed under "Excavation" and "Hazardous Waste Transportation".	ste Transportation".
Excavation and Treatment by On-Site Incineration	Excavate and treat soil by a mobile incinerator which thermally destroys organics in a direct fired treatment unit.	RCRA, Incinerators; (Subpart O, 264.340-264.599)	This regulation specifies the performance standards, operating requirements and monitoring, inspection, and closure guidelines of any incinerator burning hazardous waste.	These substantive requirements established by this rule are potentially relevant and appropriate for on-site incineration of RCRA-regulated wastes.

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTIC	IN-SPECIFIC ARARS FOR SOIL	POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
		Chapter NR 665; Wisconsin Hazardous Waste Incinerator Standards	This chapter establishes requirements and standards for incinerators that burn hazardous wastes. Requirements for design of the incinerator are outlined in Section NR640.06.	The substantive requirements of this rule are potentially relevant and appropriate for on-site incineration of RCRA-regulated wastes.
		Also, see requirements liste	Also, see requirements listed under "Excavation" and "Air Emissions".	
Excavation and Treatment by Off-site Incineration	Excavate and treat soil by an inclnerator which thermally destroys organics in a direct fired treatment unit.	RCRA, Incinerators; (Subpart O, 264.340-264.599)	This regulation specifies the performance standards, operating requirements and monitoring, inspection, and closure guidelines of any incinerator burning hazardous waste.	These requirements are potential applicable or relevant and appropriate requirements for offsite incineration of RCRA-regulated wastes.
		Chapter NR 665; Wisconsin Hazardous Waste Incinerator Standards	This chapter establishes requirements and standards for incinerators that burn hazardous wastes. Requirements for design of the incinerator are outlined in Section NR640.06.	The substantive requirements of this rule are potentially applicable or relevant and appropriate requirements for offsite incineration of RCRA-regulated wastes.
		See requirements listed und	See requirements listed under "Excavation", "Air Emissions", and "Hazardous Waste Transportation"	rdous Waste Transportation*

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTIO	M-SPECIFIC ARARS FOR SOIL	POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Excavation and Treatment by Solvent Extraction	Excavate and mix soils with a chemical solvent in a mobile batch mixer. Soil settles out and solvent and contaminant is decarted off. The contaminant is then separated from the solvent to produce an effluent stream of concentrated contaminant.	See requirements listed und	See requirements listed under "Excavation" and "Hazardous Waste Transportation"	nsportation"
Excavation and Treatment by Stabilization/	Soll is excavated and mixed with a settling agent to form a hard product in which contaminants are entrapped by the solidified mass.	See requirements listed und	See requirements listed under "Excavation" and "Hazardous Waste Transportation".	nsportation".
Excavation and Treatment by Anaerobic Thermal Prucess	Soil is excavated and treated by a mobile unit which volatilizes/desorbs organic contaminants from the soil and condenses them into a liquid stream.	See requirements listed und	See requirements listed under "Excavation", "Hazarowaa Waste Transportation", and "Air Emissions"	ortation", and "Air Emissions".

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

TECHNOLOGY DESCRIPTION SPECIFIC ARARIS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES TECHNOLOGY DESCRIPTION Excavation and vashing adulator in a queous-based washing any soil with the system wobile washing units. Organics and increased from soils with this system. Washing solution is recycled. Excavation and Soils are excavated and headed to temperatures excavation and headed to temperatures excervation and less tremplating contraminents are immobile lized into a gelosologically stable glass material, and stable glass material, and

TABLE 3-5 POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

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	POTENTIAL ACTIC	N-SPECIFIC ARARS FOR SOIL	POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Excavation and Treatment by Blodegradation/ Composting	Soils contaminated by organics are excavated and treated with engineered (rather than naturally occurring) biological decomposition under controlled conditions.	See requirements listed un	See requirements listed under "Excavation" and "Hazardous Waste Transportation".	ansportation".
Excavation and Treatment by Forced Aeration Through Soils	A soil pile in constructed on an elevated perforated base through which air is force into the pile.	RCRA, Waste Piles; (Subpart L, 264.250-264.269)	This regulation establishes procedures, operating requirements, and closure and post-closure for waste piles.	Should a remedial action involve the placement of hazardous wastes in waste piles, this regulation would be applicable. According to RCRA, waste piles used for treatment or storage of non-containerized accumulation of solid, non-flowing hazardous waste may comply with either the waste pile or landfill requirements. The temporary storage or treatment of hazardous waste on-site, therefore, should meet the requirements of one or the other subpart.
		Also, see all regulations liste Emissions"	Also, see all regulations listed under "Excavation", "Hazardous Waste Transportation", and "Air Emissions"	Transportation", and "Air

TABLE 3-5 POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	POTENTIAL ACTIO	M-SPECIFIC ARARS FOR SOIL	POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
In-Situ Vacuum Extraction	A vacuum is applied to wells at the site to extract vapor from voids in the subsurface soil. The vapor is collected and either treated or released to the atmosphere.	See requirements under "Air Emissions".	Emissions".	
In-Situ Stabilization/ Solidification	A settling agent is places with contaminated soil to form a monolithic product in which contaminants are entrapped by the solidified mass.	See requirements under *Air Emissions".	Emissions".	
In-Situ Bioventing	Air, nutrients, and moisture (as needed) are injected into a contaminated soil zone to enhance the indigenous microbe environment and increase the biodegradation rate of organic contaminants.	See requirements under "Air Emissions"	Emissions"	

continued

TABLE 3-5
POTENTIAL ACTION-SPECIFIC AP LICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

HSPOSAL TECHNOLOGIES	REQUIREMENTS CONSIDERATIONS			
POTENTIAL ACTION-SPECIFIC ARARS FOR SOIL TREATMENT AND DISPOSAL TECHNOLOGIES	CITATION RECA	See requirements under "Air Emissions".	See requirements under "Air Emissions".	See requirements under "Air Emissions".
POTENTIAL ACTIC	DESCRIPTION	Soils contaminated by organics are treated in place with engineered (rather than naturally occurring) biological decomposition under controlled conditions.	Soils are heated in place to temperatures exceeding 2000°C. Organic and nitrate chemical components are destroyed, the remaining contaminants are immobilized into a geologically stable glass material, and the overall volume of the waste is reduced.	Air is forced into an existing soil pile to enhance biodegradation of organic contaminants.
	TECHNOLOGY	In-Situ Biodegradation/ Composting	in-Sku Vkrification	in-Situ Forced Aeration through Soil Pites

TABLE 3-5 POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	ACTION-SPECIFIC A	ACTION-SPECIFIC ARARS FOR WATER TREATMENT AND DISPOSAL TECHNOLOGIES	4D DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Containment with Slurry Wall	Emplacement of a low permea- bility barrier to restrict groundwater migration. Should include a cover system to reduce infiltration.	RCRA - Land Disposal Restriction (40 CFR Part 268)	See requirements under "Land Disposal Restrictions".	Excavation of soil for construction of slurry wall may trigger LDRs. Materials subject to LDRs must therefore be placed in another unit.
Collection of Water into Groundwater Extraction Wells	Installation of several strategically located pumping wells to collect contaminated groundwater for treatment.	WDNR, Wisconsin Well Construction Standards, (WAC, Chapter NR 112)	This rule establishes standards and approvals for well construction. Any withdrawal well or combination of wells withdrawing more than 70 gpm or more is subject to this rule.	Any remedial alternative considered during the FS which proposes pumping of groundwater at a rate of greater than or equal to 70 gpm will consider this rule as a possible ARAR.
Treatment with UV/ Oxkdation	Oxidize organic contaminants in extracted groundwater through simultaneous application of UV light and ozone or hydrogen peroxide.	See requirements under "Air Emissions"	nissions".	
Treatment with Air Stripping	Reduce concentration of volatile organics through intimate contact of extracted groundwater with air. Water descends a packed column while air forced up the column to promote mass transfer of organics from aqueous to gaseous phase.	See requirements under "Air Emissions".	nissions".	

continued

TABLE 3-5 POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	ACTION-SPECIFIC A	ACTION-SPECIFIC ARARS FOR WATER TREATMENT AND DISPOSAL TECHNOLOGIES	D DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Treatment with Carbon Adsorption	Reduce concentrations of aqueous or gaseous phase organics through adsorption onto granular activated carbon. May be used as a polishing strip for treatments such as air stripping to further reduce organic contaminant concentrations in groundwater or to capture organics in air stripper emissions. Process produces concentrated wastestream requiring further treatment.	See requirements under "Air Emissions".	issions".	
Treatment with Resin Adsorption	Contaminants are transferred from the dissolved state to the surface of the resin. Resin can be regenerated by removing the contaminants with solvent. Process produces a concentrated wastestream requiring further treatment.	No requirements identified.		
In Situ Biological Treatment	Introduce nutrients, oxygen, and methane into the groundwater using a matrix of extraction wells and recirculation techniques.	See requirements under "Air Emissions"	iisslons*.	

TABLE 3-5
POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

	ACTION-SPECIFIC A	ACTION-SPECIFIC ARARS FOR WATER TREATMENT AND DISPOSAL TECHNOLOGIES	4D DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Discharge into Off- Site Water Treatment Facility	Off-site disposal of extracted groundwater to a POTW. Groundwater would require transport by means of a force main and/or gravity feed sewer or by truck to the POTW.	CWA, National Pretreatment Standards; (40 CFR Part 403)	This regulation sets pretreatment standards for the Introduction of pollutants from nondomestic sources into POTWs. These regulations are designed control pollutants which pass through, cause interference, or are otherwise incompatible with treatment processes at a POTW.	If treated groundwater is discharged to a POTW, the discharge must meet all discharge limitations imposed by the POTW.
		Also, see requirements listed under "Transportation".	nder "Transportation".	
Discharge by Groundwater Reinjection	Groundwater is reinjected using a series of wells and pumps. Can be used to enhance plume removal and accelerate remediation.	SDWA - Underground Injection Control Regulations; (40 CFR Parts 144, 146, 147, 1000)	These regulations outline minimum program and performance standards for underground injection programs.	State regulations prohibit discharge of water by reinjection wells.
		WDNR, Wisconsin Well Construction Standards, (WAC, Chapter NR 112)	In addition to establishing standards and approvals for well construction, this regulation prohibits the use of injection wells of any sort.	Because the state requirement is an enforceable requirement and more stringent than the federal requirements, it takes precedence of the federal requirement for remedies using reinjection wells.

POTENTIAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS TABLE 3-5

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

	ACTION-SPECIFIC A	ACTION-SPECIFIC ARARS FOR WATER TREATMENT AND DISPOSAL TECHNOLOGIES	ND DISPOSAL TECHNOLOGIES	
TECHNOLOGY	DESCRIPTION	CITATION	REQUIREMENTS	CONSIDERATIONS
Discharge to Surface Water	Discharge treated groundwater directly to nearby surface water body. Transport groundwater by means of force main.	Clean Water Act (CWA), National Pollutant Discharge Elimination System (NPDES); (40 CFR Part 122, 125)	This rule requires permits specifying the permissible concentration or level of contaminants in the effluent for the discharge of pollutants from any point source into waters of the U.S.	Both on- and off-site discharges to surface waters are required to meet the requirements of the NPDES, including discharge limitations, monitoring requirements, and best management practices.

Notes:

reatment, storage, or disposal
Resource Conservation and Recovery Act
Treatment, Storage, and Disposal Facility
Department of Transportation
U.S. Environmental Protection Agency TSD HCRA TSDF DOT EPA

Solid Waste Management Act

= Clean Air Act
= Wisconsin Department of Natural Resources
= National Ambient Air Quality Standards
= Land Disposal Restrictions

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TABLE 4-1 EXPOSURE PATHWAYS CURRENT AND FUTURE LAND USE

POTENTIAL EXPOSED POPULATION	EXPOSURE, ROUTE, MEDIUM AND EXPOSURE POINT	PATHWAY SELECTED FOR EVALUATION?	REASON FOR SELECTION OR EXCLUSION
Grounds Maintenance Workers	Dermal contact with, incidental ingestion and inhalation of chemicals in surface soil	Yes (current and future scenario)	Potential exists for workers to be exposed to chemicals in surface soil.
Research Workers	Dermal contact with and incidental ingestion of chemicals in surface soil	No	On site infrequently and not expected to visit contaminated areas.
Hunters	Dermal contact with and incidental ingestion of chemicals in surface soil	No	Magnitude of exposure less than that of grounds maintenance worker.
	Ingestion of chemicals in deer meat	No	Tissue analysis of deer meat indicates that it is not contaminated.
Farmer	Dermal contact with, incidental ingestion, and inhalation of chemicals in surface soil	Yes (future scenario)	Although no contaminated areas are currently used for crop farming, the potential exists for some areas to be farmed in the future.
	Ingestion of chemicals in beef	No	No cattle are currently grazed on contaminated soil. Physical characteristics of contaminated areas make them unlikely future pastures.
Construction Worker	Dermal contact with, incidental ingestion of, and inhalation of chemicals in surface and subsurface soils	Yes (future scenario)	Potential exists for future land use to involve excavation for foundations or utilities.
Residents	Dermal contact with and incidental ingestion of chemicals in surface soil	Yes (future scenario)	Although it is not a realistic future use, residential scenario is selected to provide a conservative comparison to other scenarios.

TABLE 4-2 EQUATIONS USED TO ESTIMATE CHEMICAL INTAKE

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

INGESTION OF SOIL OR SEDIMENT

Intake (mg/kg-day) = $\frac{CS \times IR \times RAF \times CF \times FI \times EF \times ED}{BW \times AT}$

where:

CS = chemical concentration in soil (mg/kg)

IR = ingestion rate (mg soil/day)

RAF = relative absorption factor (unitless)¹
CF = conversion factor (10⁻⁶kg/mg)
FI = fraction ingested from site
EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time - period over which exposure is averaged (days)²

DERMAL CONTACT WITH SOIL OR SEDIMENT

Absorbed Dose (mg/kg-day) = $\frac{CS \times AF \times SA \times RAF \times CF \times EF \times ED}{BW \times AT}$

where:

CS = chemical concentration in soil (mg/kg)
AF = soil to skin adherence factor (mg/cm²)
SA = skin surface area exposed (cm²/event)
RAF = relative absorption factor (unitless)¹
CF = conversion factor (10-6 kg/mg)
EF = exposure frequency (days/year)
ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time - period over which exposure is averaged (days)²

(continued)

TABLE 4-2 EQUATIONS USED TO ESTIMATE CHEMICAL INTAKE

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

INHALATION OF SUSPENDED PARTICULATES OR VOLATILES

Intake (mg/kg-day) =
$$\frac{CA \times RAF \times IhR \times ET \times EF \times ED}{BW \times AT}$$

where:

CA = chemical concentration in air (mg/m³)

IhR = inhalation rate (m³/hour)

RAF = relative absorption factor (unitless)¹

EF = exposure time (hours/events) EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time - period over which exposure is averaged (days)²

INGESTION OF SURFACE WATER

Intake (mg/kg-day) = $\frac{CW \times RAF \times CR \times ET \times EF \times ED}{BW \times AT}$

where:

CW = chemical concentration in water (mg/1)

CR = contact rate (L/hour)

RAF = relative absorption factor (unitless)¹

ET = exposure time (hours/event)

EF = exposure frequency (events/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time - period over which exposure is averaged (days)²

TABLE 4-2 EQUATIONS USED TO ESTIMATE CHEMICAL INTAKE

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

DERMAL CONTACT WITH SURFACE WATER

Absorbed Dose (mg/kg-day) = $\frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$

where:

CW = chemical concentration in water (mg/1)

SA = skin surface area (cm²/event)

PC = chemical specific dermal permeability constant (cm/hr)³

ET = exposure time (hours/event)

EF = exposure frequency (events/year)

ED = exposure duration (years)

CF = conversion factor (1 liter/1000 cm³)

BW = body weight (kg)

AT = averaging time - period over which exposure is averaged (days)²

Notes:

PAF - Ingestion and Inhalation: Assumed to be 100%.

RAF - Dermal: Little data exist regarding the fraction of chemicals in soil that cross the skin. In the absence of this data, the dermal pathway will not be evaluated.

- AT: The averaging time is the pathway-specific period of exposure for noncarcinogenic effects (e.g., AT = ED x 365 days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years x 365 days/year).
- PC: If chemical-specific PC value is not available, the permeability of water (1.5x10⁻³) is used as a default value.

Source: USEPA, 1989b

TABLE 4-3 **EXPOSURE PARAMETERS -**OCCUPATIONAL/RECREATIONAL CONTACT WITH SOIL AND SEDIMENT

REMEDIAL INVESTIGATION **BADGER ARMY AMMUNITION PLANT**

PARAMETER	MAINTENANCE WORKER	CONSTRUCTION WORKER	FARMER	OLDER CHILD (6-16)	Units	SOURCE
Soil Ingestion Rate (IR)	100	480	480	100	mg/day	USEPA, 1991b
Inhalation Rate (IhR)	2.5	2.5	1.7	NA	m³/hr	USEPA, 1990
Soil Adherence Factor (AF)	1.0	1.0	1.0	1.0	mg/cm²	USEPA, 1992a
Surface Area Exposed (SA) ¹	2,100	2,100	2,100	6,150	cm²	USEPA, 1990
Fraction Ingested from Site (FI)	100%	100%	100%	100%		Assumpt ion
Exposure Time (ET)	8	8	1	NA	hours/day	Assumption
Exposure Frequency (EF) ²	24	20	24	24	days/year	USEPA, 1991b/ Assumption
Exposure Duration (ED)	25	20 days	30	11	years	USEPA, 1991b/ Assumption
Body Weight (BW)	70	70	70	40	kg	USEPA, 1989b
Averaging Time (AT)						110000 annu
Cancer Noncancer	70 25	70 20 days	70 30	70 11	years years	USEPA, 1991b/ Assumption

Notes:

2,100 cm 2 = 50th percent le value - hands and forearms 6,150 cm 2 = 50th percentile value - hands, feet, arms, and legs

24 days = 2 days/week for 12 weeks (summer season)

20 days = 5 workdays/week for 4 weeks

milligram mg

hour hr

cm² square centimeter

kg m³ kilogram

square meter not applicable

W0039213T.5/5

6853-12

TABLE 4-4 EXPOSURE PARAMETERS -FUTURE RESIDENTIAL SURFACE SOIL CONTACT

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

PARAMETER	CHILD 1-6	ADULT 7-30	UNITS	Source
Soil Ingestion Rate (IR)	200	100	mg/day	USEPA, 1991b
Soil Adherence Factor (AF)	1.0	1.0	mg/cm²	USEPA, 1992a
Surface Area Exposed (SA) ¹	3,720	2,100	cm²	USEPA, 1990
Fraction Ingested from Site (FI)	100%	100%		Assumption
Exposure Frequency (EF)	350	350	days/year	USEPA, 1991b
Exposure Duration (ED)	6	24	years	USEPA, 1991b
Body Weight (BW)	15	70	kg	USEPA, 1989a/1991b
Averaging Time (AT)				
Cancer	70	70	years	USEPA, 1991b
Noncancer	6	24	years	USEPA, 1991b

Notes:

Child: 50th percentile area - hands, feet, arms, and legs Adult: 50th percentile area - hands and forearms

milligram

mg cm² square centimeter kilogram

kg

TABLE 4-5 RECREATIONAL CONTACT WITH SURFACE WATER

PARAMETER	OLDER CHILD (6-16)	Units	Source
Contact Rate (CR)	0.05	L/hour	USEPA, 1991b
Surface Area Exposed - Swimming (SA _s) ¹	13,000	cm²	USEPA, 1990
Surface Area Exposed - Wading (SA,,) ²	6,150	cm²	USEPA, 1990
Exposure Time (ET)	2.6	hrs/day	USEPA, 1989b
Exposure Frequency (EF) ³	24	days/year	USEPA, 1989b
Exposure Duration (ED)	11	years	Assumption
Body Weight (BW)	40	kg	USEPA, 1990
Averaging Time (AT) Cancer Noncancer	70 11	years years	USEPA, 1991b Assumption

50th percentile - whole body

50th percentile - hands, feet, arms, and legs 2 days/week for 12 weeks (summer season)

liter

square centimeter kilogram cm²

kg hrs

hours

TABLE 4-6 ORAL DOSE-RESPONSE INFORMATION FOR NONCARCINOGENIC EFFECTS

PRD PRD	* · · ·	ONAL NO (mg/kg-day) **	STUDY	CONFIDENCE		TEST	UNCERTAINTY	900
	3 0 0	mg/kg-day) **		CONFIDENCE		TEST	UNCERTAINTY	_
CONNO	3 0 5 0	mg/kg-day)	TYPE	i				
	M 20-	10-93		LEVEL	CRITICAL EFFECT	ANNA	FACTOR	
	8 8 8	,	o o		Hepatotoxicity	Gumes Pig	1,000	HEAST
	ह ह	30+ 3	Gevage		Hyperactivity, decreased body weight	Per	6	HEAST
	ষ্	Q	Feeding	High	Neurotoxicity, Heirz bodies and billiary tract hyperplasia	oo O	100 A	200
	ខុ	9						PIB
	1E-02	•						
	16-02							
		1E-01	Gavage		Spleen Lesions	2	10,000	HEAST
	1E-01	16+00	Gavage	LOW	Increased liver and kidney weights, nephrotoxicity	R.	1,000 HA.S	5
	SE-03	8-38	Therapeutic	Medium	Argyria	Human	21	200
		5						HEAST
	6E-02	6E-01	Gevege	LOW	Hepatolouidity	Mouse	3,000 H.D	5 G
AS B2EHP		. 02						25
ВУЕНР	36-04 P	2- W	Oral - diet	Medium	Keratosis and hyperpigmentation	Huner	He	RE
40	2E-02	26-02	Oral - diet	Medium	Increased liver weight	Guines Pig	1,000HA,S	F.6
5	76-02	76-02	Oral-DW	Medium	Increased blood pressure	Human	T es	20.00
BAANTR		9						27.6
BBFANT		•						FIS
96	SE-03	SE-03	ΜO	LOW	None observed	R	100HA	55.
BGH#PY ND		• 02						FIRE
BIGFANT	•	9						FR.6
BR Not Listed	sted							
C6H6								35
CCI3F	3E-01	7E-01	Gavage	Medium	Survival and histopathology	Ret	1,000 H.A.L	21.0
CCLA	76-04	7€-03	Gavage	Medium	Liver lesions	Part	1,000 H.S	FRIS
CD (flood)	1E-03	None	Orel-diet	High	Significant proteinuria	Human	10H	F. 65
CD (water)	SE-04	None	OralDW	High	Significent proteinuria	Human	10 H	IRIS
CHRCL2	6E-02	ØE −02	ρw	Medium	Liver toxicity	Ret	100 H.A	FAIS
СНСІЗ	1E-02	1E-02	Oral-diet	Medium	Fathy cyat formation in liver	800	1,000 HAS	RE
CM YEAR	•	•						FAIS
CL Not Listed	isted							
CR ≡	1E+00	1E+00	Oral - diet	Low	No effects observed	Œ.	100 H.A.: MF=10	RS
D. B.O.	£ −83	26-02	Oral-DW	Low	No effects reported	œ.	SOO H.A.S	A.S.
ON no	5	2						RIS
UBAHA NO	9	ż						FRS
Data inade	Data inadequate for risk as	sessment						HEAST
630	10-38	00+ 39	Oral - diet	LOW	Reduced terminal body weight	T.	1,000 H.S	HEAST
	16 -01	1E+00	Oral - diet	row	Increased mortality	200	1,000 HA.S	RIS
DNO	2£ -02 A	2E-02	Oral - diet		Elevated SGOT, SGPT, liver & kichney weight	n n	000;	HEAST
DpA	2.5E -02	2 SE -02	Oral - diet	Medum	Decreased body weight gain, increased liver & kichey weight		100 H.A	E SE
(Fleats	16-01	1F +00	Oral-diet	Low	Liver and kidney toxicity	The state of the s	1,000 H.S	FRIS

TABLE 4-6 ORAL DOSE-RESPONSE INFORMATION FOR NONCARCINOGENIC EFFECTS

	CHIDOM	CHACALLACTIC						
	ORAL							
	Ş	9	STUDY	CONFIDENCE		TEST	UNCENTABILITY	
COMPOUND	(mg/kg-day)	(mg/kg-day) **	TYPE	LEVEL	CRITICAL EFFECT	AMMA	FACTOR	SOUNCE
FAMT	20-Y	10-¥	Gavage	Medium	increased liver weights, hemstologic changes	Mouse	3,000 H.S	28
FURENE	29-₩	4€-01	Genege	LOW	Hematologic changes, decreased RBC	Mouse	3,000 H.S	316
FG.	3E-04P	3E-04	Perentara		Kichey effects	Per	1,000	HEAST
HCOPYR	9	•QN						7.6
MECOHS	2E-01	2E+00	Gevege	Medium	Weight change in liver and tidheys	Ret	1,000HA.8	PUB
MIBK	%E05 W	SE-01	Gevege		Liver and tidney effects	Ref	1,000	HEAST
MN	1E-01	1E-01	Oral-diet	Medium	CNS effects	Human	1	56
dv	4€-02 P	€ -02	Gevage		Decreased body weight gain	ž	10,000	HEAST
S.C.	Not Listed							
NG	Not Listed							8368
N+13	34 mg/L R	34 mg/L	W		Teste tiverhold	Human	none	50.0
NH:N2	Not Listed							
2	26-02	26-02	Oral diet	Medium	Decreased body and organ weights	Ref	100HA	2.0
NET (NO2)	1E-01		Epidemiologic	5	Early citrical signs of methemoglobhemia	Human intent	1 1	818
ratt (NO3)	1.06:+00	2	Epidemiologic	High	Early citrical signs of methemoglobhemia	Human intent	1 1	3.6
NNOMEA	2	9						26
NNCNPA	9	9						FIG
NNDPA	9	2						25
9-4	9	2						73.65
Pitanta	Q	. 02						HEAST
PYR	3€-02	3E-01	Gavage	Low	Kidney effects, renal tubular pathology	Mouse	3,000 H.A.S	7.6
SE	SE −03	5€−03	Epidemiologic	Medium	Clinical setenosis	Humen	3H	70.55
ZS	0E-1		Diet		Liver and kidney leavons	73.EE	100	HEAST
SOA	Not Listed							
TOLEE	1€-02	1E-01	Gevage	Medium	Hepatotoxicity	Mouse	1,000H,A,8	RB
TACLE	Q.							R
^	7E-03	7E-03	Oral-DW		None observed	Ret	100	HEAST
XYLEN	2€+00	Ø++90	Gevege	Medtum	Hyperactivity, decreased body weight	a a	100 H.A	26
ZV	2E-01	16-91	Therapeutic		Anemia	Human	10	HEAST
ND - No data available	"RID for naphthalme is used as sum	ed as surrogate		Uncertainty factor	Uncertainty factorit! - variation in human sensitivity			
W - RID withdrawn from IRIS	for PAHs without assigned RID	1RD			A - enimal to human extrapolation			
P - RiD pending in IRIS	**Alt subdironic values are obtained	e obtained			S - extrapolation from substranic to chronic NOAEL			
N : No data in IRIS	from HEAST 1992				L - extrapolation from LOAEL to NOAEL			
NE - Not evaluated by IRIS	**** Chronic RID used when no subchronic RID is available	when no subchronic Rif	D is available		N - NOEL not attained			
H Under review by RKS					D - Lack of supporting data			
					Additional uncertainty factors or modifying factors (MF) of			
sounces:					1 to 10 may be added to account for other uncertainties			
Hits - Integrated Risk information System files us of August 1992	ratem files us of August 199	24			such as inadequacies in the database or the severity of the effect	D S		
I EAST Health Effects Assessment Tables 1942	Tables 1992							
								USATOBO MAK

TABLE 4-7 ORAL DOSE-RESPONSE INFORMATION FOR CARCINGGENIC EFFECTS

	Weight of	Slope Factor		Study		
Compound	Evidence	[(mg/kg/day)(-1)]	Test Species	Type	Tumor Type	Source
1111CE	٥					Pate
1:3OMB	0					HEAST
24DNT	82	+10-38'9	Ret	Diet	Liver, mammary gland	5
ZBDNT	B2	€.8€-01 •	Ret	Diet	Liver, mammany gland	SIR
2MNAP	NE					810
2NNDPA	Not Listed					
ant	Not Listed					
ACET	٥					s)di
AG	٥					ERIS.
7	Not Listed					
ANAPNE	NE.					Si.C.
ANAPYL	٥					5
AS	٧	1.8E+00 **	Human	W	Skin tumors	S C
B2EHP	82	1.46-02	Mouse	Omi/Diet	Hepatocellular carcinoma	IRIS
ВА	R					Sign
BAANTR	682	ON ON				PAIS.
BAPYR	82	7.3€+00	Mouse	D.	Forestornsch	1918
BBFANT	82	ON ON				SIL
96	82	4.36+00	Ret	₩	Total tumora	81-81
ВСНРУ	۵					IA18
BIGANT	B2	Q.				SE SE
88	Not Listed					
CGH6	4	2.96-02	HUTTEN	Occup.	Louterrie	FR:8
cclaf	NE					SIRI
CCL4	82	1.36-01	Several	Gevege	Liver	#RIS
8	ē	WA				FRIS
CH2CL2	83	7.56-00	Mouse	DW	Hepatocellular	SiR
CHCL3	82	6.1E-03	Pet	Æ	Kidney	IRIS
CHRY	B2	YN YN				MIS
כר	Not Listed					
CA III	N.					SIE
CR.V	≺	٧٧				RIS
3	٥					SIE
рвана	82	QN				SiFt
DBZFUR	۵					RIS
ОЕР	۵					SICE
DNBP	۵					SIG
DNOP	Not Listed					
DPA	Q					R.S
ETC6H5	٥					£ Sign
	_					

TABLE 4-7 ORAL DOSE-RESPONSE INFORMATION FOR CARCINGGENC EFFECTS

		PEO				
	Weight of	Strr. Factor		Study		
Compound	Evidence	[(mg/kg/us;;)(-1)]	Test Species	Type	Tumor Type	Source
FLAENE	٥					SIF
HG	0					FRIS
ICDPYR	62	ON				FRIS
MECOHS	٥					FRIS
MBK	NE					RIS
22	٥					85
NAP	٥					Zi Zi
25	Not Listed					
. ON	Not listed					
NAS.	Not Listed					
NHONE	Not Listed					
Ž	¥					20.0
NIT (NO2)	۵	,				10 18
NIT (NO3)	۵					28
NNDMEA	82	5.16+01	Per	W.	Liver	FAUS
NADADA	B 2	7.0€+00	Pet	MO	Liver	8718
NACPA	82	4.9E-03	Pet	Diet	Urinary bladder	818
æ	82	Q.				Sign
PHANTR	٥					818
PYA	٥					8118
8E	٥					Ris
NS	Not Listed					
804	Not Listed					
TOLEE	B 2	5.1E-02 W.X	Mouse	Gavage	Livertumors	HEAST 1901
TACLE	92	1.1E-02 W.X	Mouse	Gavage	Liver	HEAST 1901
>	ON					Tais Sign
XYLEN	٥					FIS
a	٥					SiG
NA - Not Applicable	*Based on IRIS for 2,4-/2,6-	r 2,4-/2,6-	Weight of Evidence:	A - Human carcinogen	ueđava	
ND - Not Determined	dinitratoluene			B - Probable h	B - Probable human carcinogen (B1 - Imited evidence of carcinogenicity in humans;	ity in humans;
NE - Not Eveluated by EPA	**Sased on unit risk of 5E-5 ug/L	isk of SE-5 ug/L		B2 - sufficient	B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack	PC.
W - Withdrawn from IRIS	in drinking water			of evidence in humans)	(Strains)	
X - Withdrawn from HEAST 1992	*** Slope factor fo	*** Stope factor for benzo(a)pyrene		C - Possible h	C - Possible human carcinogen	
P - IRIS irput pending R - Under review on IRIS	used as sumogate value	ate value		O - Not classifi E - Evidence o	D - Not classifiable as to human carcinogenicity E - Evidence of lack of carcinogenicity to humans	
DW - Drinking water						
SOURCES: IRIS - Integrated Risk Information System files as of August 1902	stem files as of Aug					
HEAST - Health Effects Assessment Tables 1992 unless otherwise noted	Tables 1992 unless	Otherwise noted				
						UBATO87 WK!

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TABLE 4~8
INHALATION DOSE-RESPONSE INFORMATION FOR CARCINGGENIC EFFECTS

	Weight of	Slope Factor*		Strict		
Compound	Evidence	[(mg/kg/day)(-1)]	Test Species	Type	Tumor Type	Source
1117CE	٥					FIRS
13DMB	٥					HEAST
24DNT	82	QN				RIS
26DNT	82	QN				RIS
2MNAP	NE					7 885
ZNNDPA	Not Listed					
SNT	Not Listed					
ACET	O					HRIS
AG	٥	•				IFIIS
AL	Not Listed					
ANAPNE	NE					IRIS
ANAPYL	٥					FRIS
AS	٧	5.0E + 01	Human	Inhalation	Respiratory tract	HEAST
82ЕНР	B2	Q				IRIS
ВА	NE					IRIS
BAANTA	82	QN				FRIS
BAPYR	82	6.1E+00	Hamster	Inhalation	Respiratory Tract	HEAST
BBFANT	B2	: QN				IAIS
BE	82	8.4E+00	Human	Occupational	Lung	HEAST
ваниру	٥					mis
ВЯ	Not Listed					
СБНВ	٨	2.9E -02	Human	Occupational	Leukemia	HEAST
CCL3F	N.					FRIS
CCL.4	82	5.3E-02	Several	Gavage	Liver	HEAST
03	10	6.15+00	Human	Inhalation	Respiratory tract	HEAST
CH2CL2	B2	Q				IRIS
СНСГЗ	83	8.16-02	Mouse	Gavage	Liver carcinome	HEAST
СНЯУ	82	QN				IRIS
מר	Not Listed					
CR III	W.	٠				IRIS
CRVI	٨	4.1E+01	Human	Occup.	Lung	HEAST
20	٥					IRIS
DBAHA	B2	÷ Q				Fars
DBZFUR	۵					MAIS
DEP	٥					Z) T
DNBP	۵					Fis
DNOP	Not Listed					
DPA	Q			-		FRIS

. TABLE 4~8 INHALATION DOSE-RESPONSE INFORMATION FOR CARCINGGENIC EFFECTS

		Inhalation				
	Weight of	Slope Factor*		Study		
Compound	Evidence	[(mg/kg/day)(-1)]	Test Species	Туре	Tumor Type	Source
ETCOHS	۵					FIRS
FANT	٥					FAIS
FLAENE	٥					RIS
НС	٥					RIS
KOPYR	82	• •				25.5
MECGHS	٥					Sir
MBK	¥					RIS
M	٥					21F2
NAP	٥					FIS
NC	Not listed					
NG	Not listed					
NH3	Not Listed					
NHONZ	Not Listed					
ī	S.					Sta
NIT (NO2)	a					25
NIT (NO3)	a					Sign.
NNOMEA	82	5.1E+01	3	Oral-DW	Liver	HEAST
NNDNPA	82	NO				FIRS
NNDPA	R2	ON				IRIS
98	62	ND				MRIS
PHANTR	٥					SHA
PYR	٥					85.0
36	٥					FIRS
NS	Not Listed					
504	Not Listed					
TCLEE	B2	Q				HEAST 1901
TRCLE	82	1.7E-02 WX Mouse	Mouse	Inhalation	Lung	HEAST 1991
^	NE					21.0
XYLEN	٥					25
ZN	Q					SIT.
NA - Not Applicable	W - Withdrawn from IRIS	rom IPIS	Weight of Evidence:	A - Human carcinogen	C	
ND - Not Determined	X - Withdrawn fr	X - Withdrawn from HEAST, 1992		B - Probable human	B - Probable human carcinogen (B1 - limited evidence of carcinogenicity in humans;	humans;
NE - Not Evaluated by EPA	DW Drinking Water	later		B2 - sufficient eviden	B2 - sufficient evidence of carcinogenicity in enimals with inadequate or lack	
	** - Cancer stop	** Cancer slope factor for BAP used for carcinogenic PAHs	cinogenic PAHs	of evidence in humans)		
Sources:	without assigned slope factors	slope factors		C - Possible human carcinogen	carcinogen	
IRIS - Integrated Risk Information System fi		les as of August 1992		D - Not classifiable at	 D - Not classifiable as to human carcinogenicity 	
HEAST - Heath Filed's Assessment Tables	and Tables 1000			F - Evidence of tack	F - Fvidence of facility of caminosepicity to humans	I SEA Tree LANG.

TABLE 4-9
INHALATION DOSE-RESPONSE INFORMATION FOR NONCARCINOGENIC BFFECTS

	CHRONIC INHALATION	SUBCHRONIC INHALATION						
	3 6	9	STUDY	CONFIDENCE		1551	UNCERTAINT	
COMPOUND	(mg/m²)	(mg/m²)	TYPE	LEVEL	CRITICAL EFFECT	ANIMA.	FACTOR	SOME !
1111706	ON	Ş						
130MB	ON	ę						HEAST
24DNT	QN	QX						2
240NT	ON	QN						3.5
SMIAP	QN	N.						2
SNNDPA	Not Listed	Not Listed						
TAGE.	ON	QV.						200
AGET	QN	QN						
9	QN	NO						25
4	Date inadequate for risk assessment							HEAST
ANAPNE	¥	발						F. 6
ANAPYL	QX	QN					_	25
New Year	QN	QN						MAS
83EHD	QN.	QN						2
4	Q¥	ON				_		1
BAANTE	QV	ON						2
BREANT	QX	QV.						2
***	QV	QN						38
BICHIPY	QN	QX						2
88	Not Listed	Not Listed						
Certe	Q	Q.						=
CCLUF	QX	QV						五
CCL4	Q	QV					-	£
CD	a	a						£15
CH2CL2	QV	QN						*
CHCL3	ON	QV				-		8
CHRY	QV	Q						£
CL	Not Listed	Not Listed				-		
CAE		2						E .
CRY	R ON	Q.					+	PRIS
co	2	Q						£ 6
ОВАНА	ON.	ON						£
DEZFUR	QN	ON						55.55
066	ON	QX		-	The state of the s			£16
DNGP	QN	ON						Fis
DNOP	QN	QN					-	£.5
	QN	Š						2
ETCOHS	QN	ON.	1			:	-	2
FANT	92	S	_	_				

TABLE 4-0
INHALATION DOSE-RESPONSE INFORMATI IN FOR MONCARCING GENC BFECTS

OPEN	Ş	Ş	STUDY	CONFIDENCE		TEST	UNCENTAINTY	
OMIC								
A.N. HO HO KOPYA	(mg/m²)	(mg/m²)	TYPE	LEVEL	CRITICAL EFFECT	ANIMA	FACTOR	SOURCE
КОРУЯ	9	ON						2
ICDPVR	3.00E -04 P	2	Inhaletion		Neuroteaticity	Human	8	HEAST
	Ş	NO						
NEC9+5	4E-01 P	2E+00 P	Inhaletion		CNS effects; eye and nose inflation	Human	900	HEAST
міфк	NO.	NO						£
NA	ON ON	ON						F. S.
NAP	9	9						HEAST
	Not listed	Not listed						
	Not leted	Not leted						
CHAN	QN	QV						3 48
ZHEHN	Not Lieted	Not Listed						
	•	d						# 150 510
HIT (NOZ)	ş	ON						8
NAT (NO3)	QN	ON						e Paris
VENDAM	MO	ND						20
NNDNPA	NO.	ON						Pris
NNDPA	MD	MD						2
86	Ş	ND						55
PHANTR	SP.	ON						HEAST
MAd	AO.	NO						1
36	Ş	QN						55
2.00	Ş	QN						HEAST
204	Not leted	Not listed						
TOLEE	Ş	QN						£
TRCLE	•	0.						₹ 9
>	9	9						HEAST
XYLEN	Ş	QN						£
NZ	Q.	QN						Si S
NO - No data avellable			Uncertainty factors:		H - variation in human sensitivity			
W - RID withdrawn from IRIS					A - animal to human extrapolation			
P - RiO pending in IRIS					S - astrapolation from substrients to chronic NOAEL	ronic NOAEL		
N - No deta in IRIS					L - estrapolation from LOAEL to NOAEL			
NE - Not evaluated by IRIS					N - NOEL not attained			
R - Under review by IRIS					D - Lack of supporting data			
Sources					Additional uncertainty factors or modifying factors (MF) of	ng factors (MF) of		
IRIS - Ingegrated Risk Information System files as of August 1992	1 August 1992				t to 10 may be added to account for other uncertainties	er uncertaintles		
HEAST - Heath Effects Assessment Tables 1992					such as inadequactes in the database or the severty of the effect	r the seventy of the	s effect	

TABLE 4-10 POTENTIAL SOURCES OF UNCERTAINTY FOR RISK ASSESSMENT

POTENTIAL SOURCE OF UNCERTAINTY	DIRECTION OF EFFECT	Justification
Likelihood of exposure pathways.	Overestimate	Pathways may not actually occur (e.g., future resident)
Use of maximum concentration and lack of consideration of degradation of chemicals.	Overestimate	Risk estimates are based on recent chemical concentrations. Concentrations will tend to decrease with time as a result of degradation processes.
Exposure assumptions (frequency, duration, and intensity).	Overestimate	Parameters selected are conservative estimates of exposure.
Lack of dermal absorption data to quantify dermal pathway for exposure to soil.	Underestimate	Dermal risk would be added to risk from ingestion and inhalation routes.
Extrapolation of animal toxicity data to humans.	Unknown, probably overestimate	Animals and humans differ with respect to absorption, metabolism, distribution, and excretion of chemicals. The magnitude and direction of the difference will vary wit each chemical. Animal studies typically involve high-dose exposures, whereas humans are exposed to low doses in the environment.
Use of linearized, multi-stage model to derive cancer slope factors.	Overestimate	Model assumes a non-threshold, linear a. low dose relationship for carcinogens. Many compounds induce cancer by non-genotoxic mechanism. Model results in a 95% upper confidence limits of the cancerisk. The true risk is unlikely to be higher and may be as low as zero.
Summation of effects (cancer risks and hazard indices) from multiple substances.	Unknown	The assumption that effects are additive ignores potential synergistic and/or antagonistic effects. Assumes similarity in mechanism of action, which is not the cas for many substances. Compounds may induce tumors or other toxic effects in different organs or systems.
Use of uncertainty factors in the derivation of reference doses.	Unknown	Ten-fold uncertainty factors are incorporated to account for various sources of uncertainty (animal-to-human extrapolation, protection of sensitive human populations, extrapolation from subchronic to chronic data, and use of LOAELs rather than NOAELs). Although some data seem to support the ten-fold factor, its selection is somewhat arbitrary.

TABLE 4-10 POTENTIAL SOURCES OF UNCERTAINTY FOR RISK ASSESSMENT

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

POTENTIAL SOURCE OF UNCERTAINTY	DIRECTION OF EFFECT	JUSTIFICATION
Lack of toxicity values for many compounds to quantify inhalation pathway for exposure to soil.	Underestimate	Risks from additional compounds would be added to currently quantified risks from inhalation exposure.

Notes:

LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level

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TABLE 5-1 PRIMARY ROUTES OF EXPOSURE FOR ECOLOGICAL RECEPTORS

Меріим	ROUTE OF EXPOSURE	POPULATIONS EXPOSED
Surface Soil	Incidental Ingestion of contaminated soll	Birds, mammals, and reptiles
	Dermal uptake	Amphibians and young, hairless mammals
Surface Water	Indirect exposures associated with the consumption of contaminated prey items	Seed-eating birds and mammals, and predatory and omnivorous mammals, birds, reptiles, and fish
	Ingestion of contaminated water	Birds, mammals, reptiles, amphibians, and fish
	Dermal contact with contaminated water	Fish, aquatic invertebrates, amphibians, and fish
Sediment	Indirect exposures associated with the consumption of contaminated prey items	Waterfowl, semi-aquatic mammals, reptiles, amphiblans, and fish
	Ingestion of contaminated sediment	Fish, aquatic invertebrates
	Dermal contact with contaminated sediments	Fish, aquatic invertebrates
	Root uptake	Aquatic plants
Air	Indirect exposures associated with the consumption of contaminated prey flems	Waterfowl, reptiles, amphiblans, and semi-aquatic mammals
	Inhalation of volatile constituents and airborne particles	Birds, mammals, reptiles and amphibians

TABLE 5-2 SUMMARY OF EXPOSURE PATHWAYS EVALUATED IN THE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

•			MEDIUM	
STUDY AREA .	SURFACE SOIL	SURFACE WATER	SEDIMENT	Air
Propellant Burning Ground	X			*
Landfill 1	NA	NA	NA	*
Final Creek	X			*
Settling Pond I	X			*
Settling Pond II	X			*
Settling Pond III	X			*
Settling Pond IV	X			*
Spoils Disposal Area I	X			*
Spoils Disposal Area II	X			*
Spoils Disposal Area III	X			*
Spoils Disposal Area IV	X			*
Spoils Disposal Area V	X			*
Deterrent Burning Ground	X			*
Existing Landfill	X			*
Rocket Paste Area	X	X	x	*
Nitroglycerine Pond	X	X	x	*
New Acid Area	NA	NA	NA	*
Oleum Plant and Oleum Plant Pond	×	X	x	*
Ballistics Pond		X	x	*
Old Acid Area	X			*
Old Fuel Oil Tank	NA	NA	NA	*

Notes:

na = no analytical data

* = pathway not evaluated

TABLE 5-3
REFERENCE TOXICITY VALUES FOR AQUATIC RECEPTORS - SURFACE WATER^A

COMPOUND	RTV (µg/£)
Surface Water	
AL	748
AS	153
BA	1,360
BE	5.3
CL	94,300
CR	9.74
CU	2.27
FE	1,000
PB	3.2
MN ,	100
HG	0.012
NI	66.13
NIT	5,000
SO4	1,060,000
v	200
ZN	49.59
NH3N2	2,100

Notes:

A Summarized from information presented in Appendix Q, Table Q-3.

 $\mu g/t = micrograms per liter$

TABLE 5-4
REFERENCE TOXICITY VALUES FOR AQUATIC RECEPTORS - SEDIMENT^A

COMPOUND	RTV (µg/2)
Sediment	
AL	_8
NH3	75
CR	100
PB	50
HG	0.1
NIT	545
SO4	-
B2EHP	-
PHANTR	1,390
DEP	-
NG	-
NNDPA	-

Notes:

No RTVs available.

A Summarized from information presented in Appendix Q, Table Q-3.

TABLE 5-5
SUMMARY OF REFERENCE TOXICITY VALUES(a) FOR TERRESTRIAL RECEPTORS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

		INDIC	ATOR SPECIES		
CHEMICAL	Small Mammai	Small Bird	Herptile	Predatory Mammal	Predatory Bird
ACET	500	500	500	500	500
MEK	131	131	131	131	131
C6H6	10	10	10	10	10
CH2CL2	52.6	52.6	52.6	52.6	52.6
ANAPNE	350	350	350	350	350
ANAPYL	600	600	600	600	600
ANTRO	3300	3300	3300	3300	3300
B2EHP	19	19	19	19	19
BAANTR	2	2	2	2	2
BAPYR	0.002	0.002	0.002	0.002	0.002
BBFANT	40	40	40	40	40
BKFANT	72	72	72	72	72
CHRY	99	99	99	99	99
DBAHA	0.006	0.006	0.006	0.006	0.006
DNBP	600	600	600	600	600
DNOP	175	175	175	175	175
DEP	172	172	172	172	172
24DNT	40	40	40	1	40
DPA	31	31	31	25	31
NNDMEA	0.46	0.46	0.46	2.5	0.46
NNDPA	50	50	50	50	50
NNDNPA	5.1	5.1	5.1	5.1	5.1
FANT	40	40	40	40	40
FLRENE	250	250	250	250	250
ICDPYR	720	720	720	720	720
2MNAP	33	33	33	33	33
NAP	35.7	35.7	35.7	35.7	35.7
NC	9000	9000	9000	9000	9000
PHANTR	14	14 .	14	14	. 14
PYR	125	125	125	125	125
CCL3F	488	488	488	488	488
NG	31.5	31.5	31.5	3	31.5
AL	100	100	100	100	100
SB	0.35	0.35	0.35	0.35	0.35
AS	7.5	1	1	250	1
BA	1	1	1	1	1
BE	0.22	0.22	0.22	0.22	0.22
CD	0.32	7.6	7.6	0.32	7.6
CR	5.7	3.5	3.5	5.7	3.5
CU	1.21	0.2	0.2	1.21	0.2
PB	0.1	2.5	2.5	3	2.5
HG	0.12	0.007	0.007	0.1	0.007
NI	1.3	10.1	10.1	62.5	10.1
NO3	133	133	133	133	133
SE	0.004	0.06	0.06	0.004	0.06
AG	18.1	18.1	18.1	18.1	18.1
SO4	120	120	120	120	120
SN	0.1	3.5	3.5	0.1	3.5
ZN	160	160	160	160	160

⁽a) Ingestion toxicity data for chronic exposures by terrestrial organisms as summarized in Table N-3.

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SUMMARY OF THE REMEDIAL INVESTIGATION FIELD PROGRAM - PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA TABLE 6-1

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		4	Program Elements	
Sites	SOIL VAPOR SURVEY	REMOTE SENSING GEOPHYSICS	Monitoring Well installation and Groundwater Sampling	SOIL BORINGS AND SOIL SAMPLING
Propellant Burning Ground	VOC-SST/MS, 135 collectors	:	25 new wells and 6 new piezometers; 116 samples from 25 new and 33 existing wells	9 borings, 112 analytical samples; 1 mud rotary boring, no analytical samples; 118 surface soil analytical samples
Landfill 1		GPR and TC	7 new wells; 14 samples from 7 new wells	2 soil borings, 10 analytical samples
Settling Ponds and Spolls Disposal Area	•	;	13 new wells; 58 samples from 13 new and 14 existing wells	1 soll boring, 6 analytical samples

Notes:

VOC-SST/MS = Volatile Organic Compounds - Surface Static Trapping/Mass Spectrometry GPR = Ground Penetrating Radar

1C = Terrain Conductivity
* Includes 2 rounds of groundwater sampling

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TABLE 6-2
SUMMARY OF BORINGS COMPLETED PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

BORING NUMBER	DEPTH OF SOIL BORING FROM GROUND SURFACE (R)	TOTAL NUMBER OF SPLIT-SPOON SAMPLES	NUMBER OF SUBSURFACE SOIL SAMPLES FOR CHEMICAL ANALYSIS	PURPOSE
Propellant Burning Ground PBB-90-01 ¹	102	01	10	Borings were drilled at the 1949 Pit area to provide chemical data to characterize the type and vertical
PBB-90-021	28	10	10	distribution of contaminants in the unsaturated soils below the 1949 Pit.
PBB-91-01	107	21	12	Borings were drilled at the former refuse pits to provide
PBB-91-02	112	22	4	chemical data to characterize the type and vertical distribution of contaminants in the unsaturated soils below
PBB-91-03	101	22	14	the former retuse pits.
PBB-91-04	107	24	13	Borings were drilled at the location of the former waste pits
PBB-91-05	ŧ	25	12	vertical distribution of contaminants in the unsaturated soils
PPB-91-06	111	21	14	Delow ure former waste pits.
PP8-91-07	44	21	13	This boring was drilled at the Old Burn Area to provide chemical data to characterize the type and vertical distribution of contaminants in the unasturated soils below the Old Burn Area.
PBB-89-10 ²	260	56	0	This boring was drilled in the Propellant Burning Ground adjacent to PBN-89-10 to obtain split-spoon samples at 10-loot intervals throughout the write unconsolidated thickness.
Landfill 1				
LOB-90-01	142	Õ	Ø	These borings were drilled at Landfill 1 to determine the nature and depth of waste materials and to characterize the vertical distribution of any contaminants leached from this site.
LOB-90-02	22	S.	-	

SUMMARY OF BORINGS COMPLETED - PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA TABLE 6-2

PURPOSE	This boring was drilled in the Settling Ponds and Spoils Disposal Area at Final Creek south of the wastewater treatment facility to assess whether use of the general purpose sewer and Final Creek to convey wastewater resulted in residual soil contamination in and below Final Creek.
NUMBER OF SUBSURFACE SOIL SAMPLES FOR CHEMICAL ANALYSIS	w
TOTAL NUMBER OF SPLIT-SPOON SAMPLES	10
DEPTH OF SOIL BORING FROM GROUND SURFACE (#)	49
BORING NUMBER	Setting Ponds and Spoils Disposal Aea SPB-01-01

These borings drilled in the area of the 1949 Pit using dual-wall driven casing.
This boring is numbered out of sequence because it was drilled using mud rotary versus hollow-stem auger (HSA) drilling techniques and is adjacent to monitoring well cluster PBN-89-10.

th = feet

TABLE 6-3
SUMMARY OF MONITORING WELLS AND PIEZOMETERS INSTALLED PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

SITE AND WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	PURPOSE
Propellant Burning Ground	g Ground		The state of the s		The second secon	
PBN-89-01 B -01 C -01 D	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing	195 210 240	711.33 676.06 635.05	אמא	Downgradient of Propellant Burning Ground	To provide horizontal and vertical definition to the plume.
PBN- 89- 02 B -02 C	Dual-wall driven casing Dual-wall driven casing	180 195	740.25 702.04	so so	Downgradient of Propellant Burning Ground, east of PBN-85-01	To provide horizontal and vertical definition of the plume.
PBN-89-03 B -03 C	Dual-wall driven casing Dual-wall driven casing	128 160	722.80 684.87	សស	Downgradient of Propellant Burning Ground, west of PBN-88-01	To provide horizontal and vertical definition of the plume.
PBN-89-04 B -04 C	Hollow-stem augers Dual-wall driven casing	150 190	713.23 671.70	ហហ	Downgradient of Propellant Burning Ground, south of PBN-88-01	To provide horizontal and vertical definition of the plume.
PBM-89-05	Hollow-stem augers	88	757.58	20	Downgradient of Propellant Burning Ground	To provide horizontal and vertical definition of the plume.
PBM-89-06	Dual-wall driven casing	150	736.37	20	Downgradient of Propellant Burning Ground	To provide horizontal definition of the plume.
PBM-89-07	Hollow-stem augers	88	758.36	&	Downgradient of Propellant Burning Ground	To provide horizontal definition of the plume.
PBM-89-08	Hollow-stern augers	130	761.56	æ	Downgradient of Propellant Burning Ground	To provide horizontal definition of the plume

TABLE 6-3
SUMMARY OF MONITORING WELLS AND PIEZOMETERS INSTALLED PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

SITE AND WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (#.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	PURPOSE
PBM-89-09	Hollow-stem augers	125	760.48	20	Upgradient of Propellant Burning Ground	To provide horizontal definition of the plume near past unspecified activities.
PBN-89-10 A -10 B -10 C -10 C	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing	130 167 205 255	763.65 723.81 697.00 645.25	20 S S S S	Downgradient of Decontamination Oven and Contaminated Waste Area	To provide horizontal and vertical definition of the plume throughout the unconsolidated thickness.
PBM-89-11	Hollow-stem augers	128	771.41	20	Upgradient of Propellant Burning Ground	To characterize water quality at the water table upgradient of the Propellant Burning Ground
PBN-89-12 A -12 B	Hollow-stem augers Dual-wall driven casing	106 140	753.66 714.04	20 5	Downgradient of Propellant Burning Ground	To provide horizontal and vertical definition of the plume.
PBN-91-06 C -06 D	Dual-wall driven casing Dual-wall driven casing	220 251	645.3 594.8	10 10	Downgradient of Propellant Burning Ground	To provide horizontal and vertical plume definition.
PBN-91-12 C -12 D	Dual-wall driven casing Dual-wall driven casing	200	668.8 620.2	10	Downgradient of Propellant Burning Ground	To provide horizontal and vertical plume definition.
PBP-91-01 B -01 C -01 D	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing	253 253 253	704.3 658.3 505.8	ot 01	Downgradient of Propellant Burning Ground	To provide vertical gradient data downgradient from Propellant Burning Ground.
PBP-91-02 B -02 C -02 D	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing	254 254 254	707.3 657.3 595.8	0 0 0	Downgradient of Propellant Burning Ground	To provide vertical gradient data downgradient from Propellant Burning Ground.

TABLE 6-3
SUMMARY OF MONITORING WELLS AND PIEZOMETERS INSTALLED PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

SITE AND Well. Identifier	О ВІІ LING М ЕТНОР	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	Purpose
Old Landfill						
LOM-89-01	Dual-wall driven casing	159	761.86	20	Upgradient of Landfill 1	To provide background water quality data upgradient of Landfill 1
LON-89-02 A -02 B	Dual-wall driven casing Dual-wall driven casing	160 200	764.59 721.13	20 5	Downgradient of Landfill 1	To provide horizontal and vertical plume definition.
LON-89-03 A -03 B	Dual-wall driven casing Dual-wall driven casing	160 200	767.14 731.99	20 5	Downgradient of Landfill 1	To provide horizontal and vertical plume definition.
LOM-91-01	Dual-wall driven casing	151	765.8	10	Upgradient of Landfill 1	To provide background water quality data upgradient of Landfill 1.
LOM-91-02	Dual-wall driven casing	148	763.9	10	Upgradient of Landfill 1	To provide background water quality data upgradient of Landfill 1.
Settling Ponds						
SPN-89-01 C	Dual-wall driven casing	135	710.04	v	Downgradient of Final Creek, prior to entrance to Settling Pond 1	in association with existing wells \$1101 and \$1113, provide horizontal and vertical definition of the plume downgradient of Final Creek.
SPN-89-02 A -02 B -02 C	Hollow-stern augers Hollow-stern augers Dual-wall driven casing	74 105 140	751.67 823.53 691.60	20 5 5	Downgradient of Final Creek, prior to entrance to Settling Pond 1	To provide horizontal and vertical definition of the plume downgradient.
SPN-89-03 B -03 C	Hollow-stern augers Dual-wall driven casing	150 150	723.09 689.25	ഗഗ	Downgradient of Final Creek, prior to entrance to Settling Pond 1	In association with existing well S1147 provide horizontal and vertical definition of the plume downgradient of the Final Creek.

TABLE 6-3
SUMMARY OF MONITORING WELLS AND PIEZOMETERS INSTALLED PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

SITE AND WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	PURPOSE
SPN-89-04 B	Hollow-stem augers Hollow-stem augers	130	730.21 697.17	សស	Downgradient of Final Creek and Settling Pond 1	In association with existing well S1148, provide horizontal and vertical definition of the plume downgradient of Final Creek.
SPN-89-05 A -05 B	Hollow-stem augers Dual-wall driven casing	09	754.25 716.02	20 5	Downgradient of Settling Ponds 2 and 3 and upgradient of Graf well	To provide horizontal and vertical definition of the plume downgradient of Settling Ponds 3 and 4 and upgradient of the Graf well.
SPN-91-02 D	Dual-wall driven casing	190	638.8	10	Downgradient of Final Creek and prior to entrance to Settling Pond 1	h association with existing nest SPN-89-02A,B,C, provide horizontal and vertical definition of the plume downgradient of Final Creek.
SPN-91-03 D	Dual-wall driven casing	202	616.2	10	Downgradient of Final Creek and prior to entrance to Settling Pond 1	In association with existing wells \$1147, \$PN-89-03B, C to provide horizontal and vertical definition of the plume downgradient of Final Creek.
SPN-91-04 D	Dual-wall driven casing	212	594.8	10	Downgradient of Final Creek and Settling Pond 1	In association with existing wells S1148, SPN-89-04B, C to provide horizontal and vertical definition of the plume downgradient of Final Creek.

TABLE 6-4
SUMMARY OF MONITORING WELLS LOGGED WITH BOREHOLE GEOPHYSICS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

SITE	/Well No.	BORING DEPTH FROM TOP OF PVC RISER (feet)	APPROXIMATE DEPTH TO WATER FROM TOP OF PVC RISER (feet)	DATE LOGGED	DATE INSTALLED	Drilling Method
1.	PBN-89-12B	142	89	5/12/89	4/15/89	Dual-wall driven casing
2.	PBN-89-04C	183	90	5/12/89	4/16/89	Dual-wall driven casing
3.	PBN-89-03C	162	87	5/12/89	3/9/89	Dual-wall driven casing
4.	PBN-89-01D	241	102	5/12/89	1/20/89	Dual-wall driven casing
5.	PBN-89-02C	195	126	5/12/89	3/19/89	Dual-wall driven casing
6.	PBN-89-10D	240	111	5/12/89	3/7/89	Dual-wall driven casing
7 .	PBN-89-11	114	107	5/13/89	3/7/89	Hollow-stem augers
8.	PBN-82-03C	117	75	5/13/89	3/15/82	Mud rotary
9.	PBN-82-05C	134	105	5/13/89	3/11/82	Mud rotary
10.	PBN-82-01C	141	108	5/13/89	3/10/82	Mud rotary
11.	PBN-89-09	124	107	5/13/89	3/1/89	Hollow-stem augers
12.	LON-89-02B	201	147	5/13/89	2/18/89	Dual-wall driven casing
13.	LOM-89-01	158	142	5/13/89	2/17/89	Dual-wall driven casing
14.	SPN-89-01C	121	65	5/15/89	3/29/89	Dual-wall driven casing
15.	SPN-89-02C	132	57	5/15/89	4/14/89	Dual-wall driven casing
16.	SPN-89-03C	131	52	5/15/89	4/13/89	Dual-wall driven casing
17.	SPN-89-04C	107	38	5/15/89	3/30/89	Hollow-stem augers
18.	SPN-89-05B	89	40	5/15/89	3/30/89	Dual-wall driven casing

Notes:

PVC = polyvinyl chloride

W0039213T.6A/8

TABLE 6-5
AQUIFER PUMPING TEST - SUMMARY OF DRAWDOWN AND RECOVERY ANALYSES
PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

	BOATON DELAY	BOALTON DELAYED YIELD DRAWDOWN ANALY	LYSEB (1)	JACOB D	JACOB DRAWDOWN ANALYSES (2)	(2)	REMOUAL DRAY	RESIDUAL DRAWDOWN ANALYSES
WELL/ PEZOMETER	Transmissivity (GPO/FT)	HYDRAULIC CONDUCTIVITY (CM/8EC)	STORATIVITY	Transmissivity (app/ft)	HYDRAULIC CONDUCTIVITY (CM/8EC)	STORATIVITY	TRANSMISSIVITY (GPD/FT)	HYDRAULIC CONDUCTIVITY (CM/BEC)
PBP-91-01B	•	•		223,000	6.03E-02	0.07	239,000	6.46E-02
PBP-91-01C	214,000	5.78E-02	0.16	285,000	7.70E-02	0.08	236,000	6.38E-02
PBP-91-01D	235,000	6.35E-02	0.17	311,490	8.42E-02	0.11	257,000	6.95E 02
PBP-91-02B	261,000	7.05E-02	0.04	•	•	•	252,000	6.81E-02
PBP-91-02C	224,000	6.05E-02	0.07		•		258,000	6.97E-02
PBP-91-02D	314,000	8.49E-02	90.0		•	•	313,000	8.46E-02
PBN-91-06C	205,000	5.54E-02	0.14				240,000	6.49E-02
PBN-91-06D	196,000	5 30E-02	0.13		•	•	249,000	6.73E-02
Average:	233,000	6.29×10 ⁻²	0.11	273,000	7.38E-02	0.08	255,500	6.915-02

(1) Boulton Delayed Yield Method not applicable for PBP-91-01B data.

(2) Jacob Drawdown Analyses not applicable for the more distant wells PBP-91-02 and PBN-91-06.

TABLE 6-6 WELLS INCLUDED IN GROUNDWATER SAMPLING PROGRAM PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

Sittes	NEW WELLS	EXISTING WELLS
Propellant Burning Ground	PBN-89-01B,C,D PBN-89-02B,C PBN-89-03B,C PBN-89-04B,C PBM-89-05 PBM-89-06 PBM-89-07 PBM-89-08 PBM-89-09 PBM-89-10A,B,C,D PBM-89-11 PBN-89-12A,B PBN-91-06C,D PBN-91-12C,D	PBN-82-01A.B.C PBN-82-02A,B.C PBN-82-03A,B,C PBN-82-04A,B,C PBM-82-05A,B,C PBM-82-02 PBM-82-03 PBM-82-04 PBM-82-05 S1109 S1117 S1146 PBM-85-01 PBM-85-01 PBM-85-02 PBM-85-03 PBM-85-04 PBM-85-05 PBM-85-04 PBM-85-06 PBN-85-01A PBN-85-02A PBN-85-03A PBN-85-03A
Subtotal	25	33
Landfill 1	LOM-89-01 LON-89-02A,B LON-89-03A,B LOM-91-01 LOM-91-02	
Subtotal	7	0
Settling Ponds and Spoils Disposal Area	SPN-89-01C SPN-89-02A,B,C SPN-89-03B,C SPN-89-04B,C SPN-89-05A,B SPN-91-02D SPN-91-03D SPN-91-04D	\$1101 \$1102 \$1103 \$1104 \$1105 \$1106 \$1107 \$1108 \$1133 \$1147 \$1148 \$1149 \$1152A,B

TABLE 6-6 WELLS INCLUDED IN GROUNDWATER SAMPLING PROGRAM PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Sittes	New Wells	Existing Wells
Subtotal	13	14
TOTAL WELLS	45	47

Notes:

A,B,C,D - Shallowest to deepest: A indicates shallowest well; D indicates deepest well in a well nest.

TABLE 6-7
CHEMICAL ANALYSES PERFORMED ON SURFACE SOIL AND SEDIMENT SAMPLES PROPELLANT BURNING GROUNDALANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

							ľ	SPO	INORGANICS					-		OTHER			OPPANCE	202		
			Γ	OTAL	TOTAL METALS			T	Γ	3	TCLP METALS	-	ANIONS	90								
SAMPLE LOCATION PP T	£	TAL	ð	ş	8	5	9	E	8	5	2	2	F	_	NH3N2	8	Ŧ	8	*	3	3	
PROPELLANT BURNIN	O OR	<u>Ş</u>																				
Burning Pade																						
PBS-91-01	-	1	ı	i	1	1	1	t	ı	1	١	1	1	1	l	I	ı	-	1	1	1	_
P65-01-02	-	ı	1	۱	ı	ı	ı	1	ļ	ļ	ı	1	1	ı	ı	ı	١	-	1	1	I	_
PBS-01-03	-	ı	1	1	ı	į	ı	1	-	-	-	-	ı	1	1	I	ı	-	1	1	i	_
PBS-91-04	-	1	1	ı	1	1	ı	1	Į	ı	ļ	1	1	ı	1	1	ı	-	ı	1	1	_
PBS-91-05	-	ı	ł	1	ı	1	1	ı	ı	ı	ı	J	1	ı	ı	1	ı	-	1	1	ł	_
PBS-81-06		ı	ı	ı	t	1	ı	ı	-	-	-	-	1	ı	ı	١	ı	-	1	1	ł	_
P8S-01-07	-	ı	ł	1	İ	1	ļ	ł	1	ı	ı	j	i	ı	l	I	1	-	I	1	1	_
PBS-61-08	-	i	ı	1	ì	ı	1	Į	;	l	ı	ı	ı	ı	1	İ	ł	-	1	1	ı	_
PBS-81-00	-	i	ı	1	1	ı	ı	ı	}	1	I	;	ı	ı	1	١	I	-	i	ı	1	_
PBS-61-10	-	1	1	ı	1	1	1	1	-	-	-	-	1	1	1	1	į	-	_	J	1	
P8S-01-11	-	ł	1	ı	ı	1	ı	ı	ı	ł	1	j	1	ı	ı	1	1	_	1	}	1	_
P88-01-12	-	1	1	1	ı	1	1	1	-	~	-	-	1	ı	ł	ı	1	-	1	1	ı	_
PBS-91-13	-	ł	1	Į	ı	1	ı	ı	1	ı	ı	1	ı	1	I	ı	ı	-	ı	1	ı	
PBS-01-14	-	ı	1	1	İ	ı	ı	1	ı	ı	1	1	ı	1	i	I	1	-	ł	1	i	_
PBS-91-15	-	1	ł	1	t	1	ı	ı	-	-	_	-	ı	1	1	I	1	_	1	1	1	_
P8S-01-16	-	ı	1	1	ı	1	ı	1	-	-	-	-	ı	1	1	I	1	-	1	1	ł	_
P8S-01-17	-	ı	1	ı	ı	1	ı	1	1	1	ı	ì	i	1	1	İ	1	-	1	1	1	_
PBS-01-18	-	1	ı	ı	ı	1	ı	1	-	-	-	-	ı	1	1	I	1	-	I	1	ı	_
PBS-01-19	-	1	ı	1	ł	1	ı	ŧ	1	1	ı	ı	ı	1	ı	ı	1	-	1	1	ł	_
PBS-01-20	-	1	1	1	ł	1	1	1	1	1	ı	ı	ł	1	ı	1	1	-	-	1	1	_
PBS-01-21	-	1	į	I	ı	1	ı	ì	-	-	-	-	ı	1	I	1	ı	_	ı		1	_
PBS-91-22	-	ı	1	ı	ı	ı	ł	i	J	ı	١	ŧ	ı	ı	ı	1	ı	-	1	1	1	_
PBS-01-23	-	l	į	i	ł	į	i	1	ı	1	ı	ł	ı	1	ı	I	ı	_	ı	1	ı	_
PBS-01-24	-	1	J	ı	ı	J	1	ı	-	-	-	-	ı	1	I	ı	i	_	1	1	1	
PBS-01-25	-	I	ļ	1	ı	ı	1	1	j	ł	1	1	1	ı	١	ı	1	-	1	1	ı	_
PBS-91-26	-	ŀ	1	1	ı	}	ı	ı	}	ı	ı	ł	1	ı	I	1	ı	-	1	1	1	
PBS-01-27	-	ı	į	1	I	ı	1	1	-	-	-	-	1	ł	1	1	1	_	١	1	١	_
PBS-91-28	-	1	1	ı	١	1	ŀ	1	ı	1	ı	i	i	1	1	t	t	-	1	1	1	_
PBS-01-29	-	I	1	ı	1	1	١	ı	-	-	-	-	ı	1	ı	1	I	-	ı	1	١	_
PBS-81-30	-	1	ı	1	ı	1	1	i	ı	ı	1	ı	1	ŀ	1	I	1	-	-	1	1	_
PBS-01-31	-	ı	į	ı	ł	1	1	1	ļ	1	1	1	1	ı	1	ı	ı	-	1	1	I	_
PBS-91-32	-	1	ļ	ŀ	1	J	ı	ı	1	i	1	i	1	ı	ı	t	ı	-	ı	1	I	_
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PBS-91-35	-	1	1	ı	1	1	1	ŀ	١	ı	1	1	1	ļ	ı	1	ı	-	!	i	İ	_
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PBS-01-37	-	1				,	1	1	١	۱۱	ı			,[1	1		-	4			

TABLE 6-7
CHEMICAL ANALYSES PERFORMED ON RUFFACE SONL AND SEDMENT SAMPLES PROPELLANT BURNING GROUNDA ANDFILL 1/SETTLING PONDS AND SPOLS DISPOSAL ANEA

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				TOTAL	TOTAL METALS	3		Γ	[5	TOLP METALS	上	AMONS	2								
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P88-61-48	-	ı	ı	ŀ	1	ı	ı	ŀ	ı	ı	ŀ	ı	ı	1	1	١	ŀ	-	1	ı	ı	-
PB-01-48	-	1	1	1	1	1	ı	ı	-	-	-	_	1	ı	ı	1	1	~	1	ı	1	-
PBB-61-40	-	1	1	ł	1	1	1	ı	ı	1	ı	ı	ı	ı	1	ı	1	-	-	ı	1	-
P86-61-46	-	1	ł	1	ı	i	ı	1	-	-	-	-	ı	1	I	I	ı	-	1	I	ı	_
Contam. Waste Area																						
17-19-884	-	1	I	I	ŧ	i	ı	ı	i	l	1	ı	ı	1	I	1	1	-	1	t	1	-
P88-61-42	-	1	1	i	ı	i	ı	ı	ı	i	ı	ı	ı	ı	ı	ı	ı	_	1	1	1	-
P88-61-48	-	ı	1	1	1	1	1	ı	-	-	-	-	ı	1	ı	1	1	-	I	ł	I	-
P88-61-42	-	1	ı	ı	ı	I	ı	1	-	-	-	_	ı	ł	1	1	i	•	i	ı	ı	-
P88-61-46	-	I	I	ı	I	ı	ı	ı	-	-	-	-	ı	ı	I	I	1	_	1	İ	ļ	-
P88-61-46	-	1	1	1	1	1	i	ı	1	1	ı	į	i	ı	I	ı	I	-	ı	1	ı	-
P88-61-47	-	ı	i	1	ı	1	1	1	ł	1	ı	ı	ł	1	ł	1	ı	-	ı	i	ı	-
P88-61-48	-	ı	ı	ı	I	ł	1	ı	-	-	-	-	ı	1	1	1	1	-	-	1	ł	-
Pace Track/Burning Plater	į																					
P69-61-60	-	ı	ı	ŧ	ı	1	ı	ŧ	ı	ı	ı	ı	ı	1	I	I	I	-	1	ı	1	-
P88-61-51	-	ı	1	ı	I	I	1	1	ı	1	1	1	1	į	I	ı	ı	-	ı	ı	ı	-
PBS-61-62	-	1	ı	I	I	I	ı	1	-	-	-	-	i	1	ı	t	i	-	ı	ı	I	-
PBS-61-53	-	I	I	I	I	١	1	I	ı	Į	1	ı	ŧ	ł	1	ı	ı	-	l	1	ı	-
P88-61-64	-	1	I	I	I	I	1	1	I	1	1	1	ı	ı	1	I	I	-	1	ı	ı	-
P68-61-56	-	ŀ	I	1	1	ı	1	ł	-	-	-	-	ı	ı	1	I	ı	_	-	i	ı	-
PBS-61-56	-	1	ł	I	I	I	ı	ı	ı	Į	1	1	1	t	1	İ	I	-	l	ı	ı	-
PBS-81-67	-	ł	I	ı	ı	1	1	1	ł	1	1	Į	1	1	ı	1	t	-	ł	I	ł	-
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PBS-01-50	-	1	i	1	1	1	1	1	1	I	ı	ı	1	ı	I	1	ı	-	1	1	t	-
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PBS-91-63	-	ı	ı	ı	ı	ı	ı	I	ı	ı	ı	1	ı	ı	1	1	1	-	1	I	ı	-
P83-91-64	-	i	1	ı	1	ı	ı	ı	١	1	1	1	ı	ı	1	ł	t	-	1	i	ı	-
PBS-91-65	-	ı	ł	ı	ı	I	ı	i	-	-	-	-	ı	ı	ı	ı	ì	-	-	ı	1	-
PBS-91-66	-	1	1	1	İ	1	I	ı	-	-	-	-	1	ı	ı	ı	ł	-	1	1	1	-
PBS-91-67	-	1	1	ı	1	1	I	ı	ł	ı	ţ	ı	ı	1	ı	ı	1	-	1	1	ı	-
PBS-01-68	-	I	1	1	1	1	ı	1	1	I	1	ł	1	i	i	1	I	-	1	ı	ı	-
PBS-01-00	-	1	1	1	1	I	ı	1	-	-	-	-	ŀ	1	t	1	1	_	1	i	1	-
PBS-01-70	-	ł	l	1	1	l	!	i	ı	ı	1	ı	!	ł	I	1	t	-	1	1	1	-
PBS-91-71	-	t	1	1	1	1	ı	ı	1	1	1	1	1	i	I	I	I	-	1	ı	ı	-
PBS-01-72	-	١	1	1	1	I	1		-	-	-	-	,	ı	1	1	1	-	1	1	1	-

TABLE 6-7
CHEMICAL ANALYSES PERFORMED ON SURFACE SOIL AND SEDIMENT SAMPLES PROPELLANT BURNING GROUND/LANDFILL 1/8ETTLING PONDS AND SPOILS DISPOSAL AREA

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	L			I I	FOTAL METALS	18		T	Γ		TCLP METALS		AMONS	9								
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PBS-01-75	-	ł	ł	1	1	I	1	ı	-	-	-	-	1	ı	1	1	ı	-	-	ı	1	_
PBS-01-76	-	ı	ı	1	í	ł	ì	1	i	ı	ı	ı	1	1	1	ı	1	-	1	1	1	-
PBS-61-77	-	I	ı	1	t	ł	ı	1	i	1	ı	ı	ı	ı	1	ı	1	-	1	ţ	1	_
PBS-01-78	-	ı	1	1	i	ı	į	1	ı	1	ı	ŀ	ı	ŀ	ı	ı	1	-	1	1	l	-
PBS-01-79	-	ı	ı	1	i	ı	j	ı	-	-	-	-	ı	1	ı	ı	1	-	1	1	I	_
PBS-81-80	-	1	ı	ı	ı	ı	1	ı	ı	ı	ı	ı	i	1	1	ı	1	-	1	1	1	-
PBS-01-61	-	1	1	1	l	ł	ı	ł	ı	ı	1	ı	i	1	ı	I	1	-	1	ı	ı	_
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PBS-01-43	-	ł	ı	ı	1	1	1	ı	t	ı	ı	ı	ı	ı	1	1	1	-	1	1	1	-
PBS-61-64	-	ı	1	I	1	1	1	1	1	1	ı	i	ı	ı	1	ı	1	-	ı	I	1	-
P83-61-65	-	I	1	ı	1	1	1	1	-	-	-	-	ł	ı	ı	ı	1	-	-	1	1	-
PBS-01-86	-	ı	1	1	ı	ı	1	i	ı	ı	ı	ı	1	ı	1	1	ı	•	1	İ	1	_
PBS-01-47	-	I	1	ı	1	t	;	ı	t	ı	ı	1	1	ı	ı	ı	ı	-	1	1	1	_
PBS-61-88	-	I	1	1	1	1	1	ı	-	-	-	-	1	ı	ı	1	ı	-	ı	I	1	_
PBS-01-10	-	ı	1	ı	ı	ļ	Į	i	١	ı	1	1	i	١	1	1	1	-	1	I	1	_
P58-81-60	-	ı	1	ı	f	ı	ļ	i	ı	ı	ı	i	1	ı	1	l	ı	_	I	į	1	_
P8S-61-61	-	I	1	ı	ł	ı	ı	ı	-	-	-	-	1	1	1	I	1	-	1	ı	ı	_
PBS-61-92	-	ı	1	t	ı	ı	;	i	1	ı	1	ı	t	ı	1	I	ı	-	1	ı	1	_
PBS-81-63	-	I	1	I	1	1	1	1	1	1	١	ı	ı	1	1	ı	i	-	1	I	ı	-
PBS-01-04	-	1	ı	1	i	ı	,	ŀ	ı	i	1	1	ı	1	1	1	t	-	t	ı	1	-
PBS-61-05	-	1	١	1	ı	1	1	1	_	-	-	-	1	1	ł	1	I	-	-	1	ı	_
748-01-86	-	l	1	1	ı	1	į	ł	-	-	_	-	1	1	۱	1	ı	-	I	ŀ	1	-
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PBS-01-00	-	ı	ŧ	ı	ı	i	1	1	-	-	-	-	1	ı	1	1	ı	-	ł	ł	i	-
PBS-01-100	-	ŀ	1	ł	ı	1	į	1	ŧ	i	1	ı	ı	ı	1	1	1	-	1	I	1	_
PBS-01-101	-	1	I	ı	ł	ı	1	1	1	1	1	ł	ı	i	I	1	ı	-	ł	1	ı	_
PBS-01-102	-	1	ł	ł	ı	I	ı	1	-	-	-	-	1	1	ı	1	I	-	I	ı	ı	_
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CHEMICAL ANALYBES PERFORMED ON SURFACE BON, AND SEDIMENT BAMPLES -PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA TABLE 6-7

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P88-01-115	-	;	1	ı	t	;	1	1	_	-	-	-	1	1	1	1	1	-	ı	I	I	_
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PBS-61-118	-	ı	ı	ı	1	1	1	ı	-	-	-	_	ſ	1	I	1	ı	-	-	ı	1	-
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PP = Priority Poliularn Metals (13) (Ag. AS. BE, CD, CR, CU, PB, Hg, NI, SB, SE, TL, ZN) TAL = Tonic Analyte List (Az.) (AL. SB, AS. BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, Hg, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCM8
GCM8 = Sea ChromatographyMass Spectrometry
BN/A = base-neutral and acid-extractable organics by GCM8

NAM = nttroesmines by GC

HPLC = High Performance Liquid Chromatrography DNT = 2.4- and 2.6-dinitrotoluene by HPLC

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CHEMICAL ANALYSES PERFORMED ON SUBSURFACE SOIL SAMPLES - PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA TABLE

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

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NOTES:

BN/A = base-neutral and acid-extractable organics by GC/MS

DNT = 2,4- and 2,6-dinitrotoluene by HPLC

GCMS = Gas ChromatographyMass Spectrometry

HPLC = High Performance Liquid Chromatrography NAM = nitrosemines by GC

PP = Priority Poliutant Metals (13) (AG. AS, BE, CD, CR, CU, PB, HG, NI, 8B, SE, TL, ZN)
TAL = Toxic Analya Liat (23) (AL. SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)
VOC = volatile organic compounds by GC/MS

(1) Only one sample was analyzed for a full suite of VOCs, the remaining samples were analyzed for CCL4, TCLEE, and TRCLE only, (2) Analyzed for CCL4, TCLEE, and TRCLE only

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TABLE 6-9
CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

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TABLE 6-8
CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES PROPELLANT BURNING GROUND/LANDFILL 1/8ETTLING PONDS AND SPOILS DISPOSAL AREA

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CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES -PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

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NOTES:

BN/A = base-neutral and acid-extractable organics by GC/MS

DNT = 2,4- and 2,6-dinitrololuene by HPLC

GCMS = Gas Chromatography/Mass Spectrometry HPLC = High Performance Liquid Chromatrography

NAM = nitroeaminee by GC PP = Priority Pollutent Metale (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN) TAL = Toxic Analyse List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

 - Well did not contain adequate water for sampling. VOC = votatile organic compounds by GC/MS

B = Analyzed in both Rounds (One and Two).

1 = Analyzed in Round One only. 2 = Analyzed in Round Two only.

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TABLE 6-10 VERTICAL GROUNDWATER GRADIENTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

Well Nest	Water Level Difference (ft.)/Screen Separation (ft.)	VERTICAL GRADIENT (FT/FT)	COMMENT ¹ (WATER LEVEL DIFFERENCE)
PBN-82-01A and B	0.02/19	0.0011u ³	Insignificant ²
PBN-82-01B and C	0.02/9	0.001u ⁴	Insignificant
PBN-82-02A and B	0.12/17	0.007u	
PBN-82-02B and C	0.06/9	0.007d	
PBN-82-03A and B	0.01/16	0.0006u	Insignificant
PBN-82-03B and C	0.01/9	0.001d	Insignificant
PBN-82-04A and B	0.08/16	0.005u	Small
PBN-82-04B and C	0.0/10	0.0	None
PBN-82-05A and B ⁵	0.09/15	0.006d	
PBN-82-05B and C	0.05/10	0.005u	Small
PBN-85-01A and PBN-89-01B	0.29/48	0.006d	
PBN-89-01B and C	0.11/32	0.0034u	•
PBN-89-01C and D	0.01/43	0.0002u	Insignificant
PBN-85-02A and PBN-89-02B	1.31/28	0.047d	Substantial
PBN-89-02B and C	0.27/33	0.008u	
PBN-85-03A and PBN-89-03B	0.67/36	0.019d	
PBN-89-03B and C	0.68/35	0.019u	
PBN-85-04A and PBN-89-04B	0.34/37	0.009d	
PBN-89-04B and C	0.53/37	0.01u	
PBN-89-10A and B	0.06/46	0.001d	Small
PBN-89-10B and C	0.34/29	0.01u	
PBN-89-10C and D	0.26/48	· 0.005d	
PBN-89-12A and B	0.10/44	0.002d	Small
PBN-89-12B and PBN-91-12C	0.06/45	0.001	Small
PBN-91-12C and PBN-91-12D	0.05/45	0.001	Insignificant

TABLE 6-10 VERTICAL GROUNDWATER GRADIENTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

Well Nest	Water Level Difference (ft.)/Screen Separation (ft.)	VERTICAL GRADIENT (FT/FT)	COMMENT ¹ (WATER LEVEL DIFFERENCE
PBM-85-06 and PBN-91-06C	0.09/111	0.0008	Small
PBN-91-06C and PBN-91-06D	0.02/53	0.0004	Insignificant
\$1101 and \$1133	0.04/37	0.001u	Insignificant
S1133 and SPN-89-01C	0.05/24	0.002d	Small
SPN-89-02A and B	0.0/36	0.0	None
SPN-89-02B and C	0.01/30	0.0003d	Insignificant
SPN-89-02C and SPN-91-02D	0.0/53	0.0	None
S1147 and SPN-89-03B	0.10/33	0.003d	Small
SPN-89-03B and C	0.02/34	0.0006u	Insignificant
SPN-89-03C and SPN-91-03D	0.12/63	0.0019	
S1148 and SPN-89-04B	0.07/30	0.002d	Small
SPN-89-04B and C	0.04/32	0.001u	Insignificant
SPN-89-04C and SPN-91-04D	0.02/100	0.0002d	Insignificant
S1152A and B	0.0/22	0.0	None
S1152B and S1103	0.24/51	0.005u	

TABLE 6-10 VERTICAL GROUNDWATER GRADIENTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL NEST	Water Level Difference (ft.)/Screen Separation (ft.)	VERTICAL GRADIENT (FT/FT)	COMMENT ¹ (WATER LEVEL DIFFERENCE)
S1104 and S1105	0.02/23	0.0009u	Insignificant
\$1105 and \$1106	0.06/26	0.0023d	Small
SPN-89-05A and B	0.09/43	0.002d	Small

Notes:

- Water levels measured on December 15, 1991.
- Insignificant gradient was concluded if the water level difference was less than the probable measurement accuracy considering the variance expect from two measurements.
- u = upward gradient
- 4 d = downward gradient
- 5 April 7, 1992 water levels
- ft/ft = feet per foot

TABLE 6-11 †-: PRIZONTAL GROUNDWATE: GRADIENTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL NEST	HORIZONTAL GRADIENT (FT/FT) ¹	COMMENT
PBM-89-11 LON-89-03A	0.0014	Northern Propellant Burning Ground; southeasterly flow vector
PBM-82-01 PBN-82-04A	0.0015	At Propellant Burning Ground; southeasterly flow vector
PBN-82-03A PBM-89-07	0.0013	South of Propellant Burning Ground; southerly flow vector
PBM-85-06 \$1148	0.0014	Propellant Burning Ground and Settling Ponds and Spoils Disposal Area; southerly flow vector
PBN-89-10B PBN-89-01B	0.0014	Propellant Burning Ground; deep gravel/cobble zone; southerly flow vector
PBN-89-01B PBN-89-04B	0.0012	Propellant Burning Ground; deep gravel/cobble zone; southerly flow vector
PBN-89-04B PBN-89-12B	0.0015	Propellant Burning Ground; deep gravel/cobble zone; southerly flow vector

Notes:

Water levels measured on December 15, 1991.

ft/ft = feet per foot

TABLE 6-12 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

Well Designation	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
PBM-89-11	1.5	4x10 ⁻²	Fine to medium sand (SP)
PBN-82-03B	3.4	1x10 ⁻³	Medium-fine sand (SP-SM)
PBN-82-03C	9.0	7x10 ⁻⁴	Medium-fine sand (SP-SM)
PBN-89-01B	3.7	3x10 ⁻²	Gravel with sand and cobbles (GP)
PBN-89-01C	10.9	3x10 ⁻²	Fine to medium sand (SP-SW)
PBN-89-01D	4.3	5x10 ⁻²	Medium-fine sand with trace gravel (SW)
PBN-89-02B	11.0	1x10 ⁻²	Fine to medium sand (SP)
PBN-89-02C	12.1	2x10 ⁻²	Fine to medium sand (SP)
PBN-89-03B	8.7	1x10 ⁻²	Sand with trace gravel (SP)
PBN-89-03C	8.7	4x10 ⁻²	Sand with trace gravel (SP)
PBN-89-04C	5.8	2x10 ⁻²	Fine sand (SP-SW)
PBN-89-10B	1.5	2x10 ⁻¹	Gravel with sand (GW-SP)
PBN-89-10C	8.5	2x10 ⁻²	Medium-fine sand, little gravel (SP-SW)
PBN-89-10D	10.7	5x10 ⁻²	Fine to coarse sand with gravel and cobbles (SP-GP)
PBN-91-06C	7.3	1.6x10 ⁻²	Medium to coarse sand, some gravel (SW)
PBN-91-12C	4.8	8x10 ⁻³	Medium to coarse sand with little fine sand and little gravel (SW)

TABLE 6-12
FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
PBN-91-12D	10.3	3x10 ⁻²	Medium to coarse sand, some gravel, little fine sand (SW)
LON-89-02B	5.0	4x10 ⁻²	Gravel and cobbles (GP-GW)
LON-89-03B	2.0	1x10 ⁻¹	medium sand and fine gravel (SP-GP)
SPN-89-01C	8.4	4x10 ⁻²	Fine sand (SP) over grave (GP)
SPN-89-02B	9.3	1x10 ⁻²	Fine to medium sand (SP)
SPN-89-02C	9.3	3x10 ⁻²	Medium to coarse and (SP)
SPN-89-03B	8.4	4x10 ⁻²	Fine sand over gravel (SP-GW)
SPN-89-04B	8.5	2x10 ⁻²	Fine sand and some gravel (SP-GW)
SPN-89-04C	10.5	2x10 ⁻²	Fine sand trace gravel (SP)
S1103	3.4	8x10 ⁻³	Medium-fine sand with some gravel (SP, SP-SM)

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TABLE 8-1? FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
S1106	9.8	7x10 ⁻³	Medium-fine sand, little gravel (SP, SP-SM)
S1107	8.6	3x10 ⁻³	Medium-fine sand, little gravel (SP, SP-SM)
S1114	7.5	2x10-2	Medium-fine sand, little gravel (SP, SP-SM)

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Field data and calculations are presented in Appendix I. Hydraulic conductivities calculated using HVORSLEV method.

Hydraulic Conductivity Tests completed during March and November 1989, and November and December 1991.

Values of hydraulic conductivities represent an averaged value of multiple tests performed on each well.

cm/sec = centimeters per second

Water level recovery at this well impacted by inertial effects resulting in water level recovery above static water level. Hydraulic conductivity measurements may be greater than calculated at this well.

TABLE 6-13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
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REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6– 13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Type: BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR	26e C:	PBS-91-21	PBS-91-22	PBS-91-23	PBS-91-24	PBS-91-25	PBS-91-26	PBS-91-27	PBS-91-28	PBS-91-29	PBS-91-30
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PYR AG - - 4.770 4.570 4.900 3.200 4.620 AS - 3.370 - 4.770 4.570 4.900 3.200 4.620 CD - 4.770 4.570 4.900 3.200 4.620 CD - - 4.770 4.570 4.900 3.200 4.620 CD - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		c f									1.420
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0.978 1.000 1.030 0.780 0.861 0.731 0.690 0.856 25.400 27.000 24.000 19.100 25.000 27.700 14.700 18.200 29.800 19.900 24.000 24.000 27.700 14.700 18.200 29.800 19.900 24.000 21.500 24.500 759.000 34.200 14.800 15.400 14.700 14.100 17.800 24.500 12.100 12.500 68.000 25.000 21.000 380.000 2300.000 1800.000 580.000 120.000 111.000 65.700 75.700 74.900 166.000 207.000 81.800		•	3.370	ı	4.770	4.570	4.900	3.200	4.820	4.290	3.740
25,400 27,000 24,000 19,100 25,000 27,700 14,700 18,200 29,800 19,900 20,700 21,500 21,500 24,000 759,000 34,200 0,070 0,156 0,465 — 0,085 0,061 0,061 14,800 15,400 14,700 14,100 17,800 24,500 12,100 12,500 68,000 25,000 21,000 380,000 2300,000 1800,000 560,000 12,000 111,000 65,700 75,700 74,900 166,000 421,000 207,000 81,800	36	0.978	1.00	1.030	0.780	0.861	0.731	0.690	0.8%	0.840	0.857
25.400 27.000 24.000 19.100 25.000 27.700 14.700 18.200 29.800 19.900 20.700 21.500 38.900 94.000 759.000 34.200 0.070 0.156 0.465 - 0.082 0.173 0.096 0.061 14.800 15.400 14.700 14.100 17.800 24.500 12.600 68.000 25.000 21.000 380.000 2300.000 1800.000 120.000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	CD	ı	ŧ	•	1	•	1	,	•		ł
29.800 19.900 20.700 21.500 38.900 94.000 759.000 34.200 0.070 0.156 0.465 — 0.082 0.173 0.096 0.061 14.800 15.400 14.700 14.100 17.800 24.500 12.500 12.500 68.000 25.000 21.000 380.000 2300.000 1800.000 580.000 120.000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <tr< td=""><td>CR</td><td>25.400</td><td>27.000</td><td>24.000</td><td>19.100</td><td>25.000</td><td>27.700</td><td>14.700</td><td>18.200</td><td>17.500</td><td>18.200</td></tr<>	CR	25.400	27.000	24.000	19.100	25.000	27.700	14.700	18.200	17.500	18.200
0.070 0.156 0.465 — 0.082 0.173 0.096 0.061 14.800 15.400 14.700 14.100 17.800 24.500 12.100 12.500 68.000 25.000 21.000 380.000 2300.000 1800.000 580.000 120.000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	no 	29.800	19.900	20.700	21.500	38.900	94.000	759.000	34.200	65.200	17,200
14.800 15.400 14.700 14.100 17.800 24.500 12.100 12.500 12.500 15.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12.000 12	HG	0.070	0.156	0.465	1	0.082	0.173	0.096	0.061	0.334	1
68.000 25,000 21.000 380.000 2300.000 1800.000 580.000 120.000	Z	14.800	15.400	14.700	14.100	17.800	24.500	12.100	12.500	16.000	13.800
111.000 65.700 75.700 74.900 166.000 421.000 81.800	84	98.000	25.000	21.000	380.000	2300,000	1800.000	\$80.000	120.000	290.000	120,000
111.000 85.700 75.700 74.900 166.000 421.000 81.800	SB	1	1	1	•	1	1	1	ı	1	1
111.000 85.700 75.700 74.900 166.000 421.000 81.800	SE		1	•	1	0.624	1	ı	1	ı	i
111,000 85,700 75,700 74,900 166,000 421,000 207,000 81,800	<u>_</u>	1	1.	1	1	ı	1	1	•	ı	1
	NZ	111.000	85.700	75.700	74.900	166.000	421.000	207.000	81.800	123.000	71.600

TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		PBS-91-31	PBS-91-32	PBS-91-33	PBS-91-34	PBS-91-35	PBS-91-36	PBS-91-37	PBS-91-38	PBS-91-39	PBS-91-40
Sample Type:		BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR
CNITS		nge	nge	ngg	ngg	9 0 0	ngg	99n	200	990	200
DATE SAMPLED:	PLED:	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91
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	CCL3F	ı	•	,	1	•	ı	ı	•	1	•
	MEK			ļ		ŀ		•	•	•	
SVOC	2MNAP										1
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	26DNT	,	,	,		ı	ı	•	•		1
	ANAPNE										•
	ANAPYL										•
	ANTRC										1
	BZEHP	•									
	BAANTR										•
	BAPYR										
	BBFANT										1
	BGHIPY										ı
	BKFANT										•
	CHRY										1
	DBAHA										ı
	DBZFUR										1 3
	DEF										800
	FANT										3 .
	FLRENE										. 1
	ICDPYR										1
	NNDPA										•
	PHANTR										1
Val.	PYR								26 600		
	S V	\$210	\$ 190	4.440	4.260	4.870	4.420	4.780	6.820	4.420	OL V
	BE	0.850	1	0.684	0.70	0.784	0.840	0.652		0.737	0.810
	CD	•	ı	1	1	ı	1	1	3.080	•	'
	CR	29.400	90.500	33,000	20.900	19.400	25.100	30.900	24.500	19.400	24.700
	OO	81.600	985.000	91.400	009:06	\$2.000	37.300	\$7,300	344,000	21.600	24.500
	HG	0.205	0.328	0.115	0.103	0.081	0.102	0.122	0.125	ı	•
	Z	17.300	38.100	14.600	15.200	17.000	18.000	31.800	20.300	14.000	15.300
	PB	1400.000	1100.000	1100.000	870.000	1100.000	1100.000	3300.000	3000.000	260.000	250.000
	SB	ı	ı	1	ı	í	ı	•	404.000	ı	ı
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	ZN	174.000	000:559	254.000	171.000	1160.000	154,000	285.000	2700.000	80.700	154,000

TABLE 6-13
SUMMARY OF SURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Type:	ii	PBS-91-41 BUGR	PBS-91-42 BUGR	PBS-91-43 BUGR	PBS-91-44 BUGR	PBS-91-45 BUGR	PBS-91-46 BUGR	PBS-91-47 BUGR	PBS-91-48 BUGR	PBS-91-49 BUGR	PBS-91-50 BUGR
DATE SAMPLED: DEPTH:	PLED:	10/01/91 0000	10/01/91 0.000	10/01/91 0.000	10/01/91 0.000	10/01/91 0.000	0.000 0.000	10/01/91 0.000	10/01/91 0,000	09/24/91 0.000	09/24/91 0.000
VOC.	ACET										à
	C6H6		•	ı	1	1	•	ı	•	ł	•
	CCL3F	•	ı	1	1	1	•	1	ı	ı	ı
	MEK									•	
SVOC	2MNAP	4 330	1	36 800	ı	I	ļ	,	0.122 2.122		
	Figure	4.440	•	47.000	ı	•	ı	•	2	•	
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	ANA BVI										
	ANTRO								۱ ۱		
	BZEHP										
	BAANTR								•		
	BAPYR								1		
	BBFANT								1		
	BGHIPY								•		
	BKFANT								1		
	CHRY								•		
	DBAHA								•		
	DBZFUR								1 }		
	DEF								0.7% 20.0		
	EANT								3.280		
	FIRENE								ć (
	ICDPYR								: I		
	NNDPA								1.310		
	PHANTR	•							0.249		
Metals	AG	1			-	1			1 1		
	AS	24.700	8.310	94.000	3.490	4.680	11.000	4.650	2.600	5.300	3.570
	BE	1	•	1	ı	•	1	ı	i	0.818	0.761
	S	4.480	1.700	1	1		1	•	1	1	
	S S	90.100	26.200	55.100	10.500	18.100	40.500	27.400	51.600	25.500	19 300
	CC	2700.000	472.000	222.000	42.300	98.700	90.400	150.000	161.000	40.500	10.400
	HG	0.258	0.072	7.700	ı	•	0.061	ı	0.430	1	:
	Z	20.800	17.600	13.500	9.070	18.300	19.100	30.700	27.300	18.100	13.300
	8. S	1100.000	330.000	2100.000	200.000	130.000	120.000	930.000	1000.000	930.000	15,000
	S S	, ,	1	1 6	ı	ı	1 6	•	ı	1	•
	,	1.10	ı	2.030	1	ı	0.618	1	ı	ı	•
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	27	3200,000	, /www	719.000	132.000	334.000	340.00G	817.UX	1500,000	444.000	62.200

TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMM HITON FLANT

Sample Type: UNITS: DATE SAMPLED: DEPTH:							10-11-00			4000
<u> </u>	BUGR	ROCK CCC	BUGR	BUGR	BUCR	8008 2011	BUGA		¥505	305 205 205
	09/24/91	0.000	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91	09/24/91
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ANAPNE					1					
ANAPYL					•					
ANTRC					•					
ВЗЕНР					1					
BAANTR					1					
BAPYR					1 !					
BULLEY										
REANT					,					
CHRY					,					
DBAHA					,					
DBZFUR					a f					
CARP					1					
FANT					ſ					
FIRENE					ı					
ICDPYR					ı					
ANDLA					t (
ALANIA					ı ı					
Metals	_	1	1				1	,		! ! !
	4.700	3.980	4.110	4.660	3.950	4.500	7.440	4.310	. 760	36.4
38	0.857	0.722	0.778	0.814	0.830	0.739	0.717	0.843	0.913	0.847
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8 0	23.000	22.300	25.100	907.37	20.800	008.17	707.17	000.07	26.000	000.02
ກ	9.570	15.100	12.000	14:400	11.600	ı	4.800	4.800	10.30	10 401
9 2 ::	, (, 60	3 2	1 2	96.33	2002.61	1 65	1 2	0000	1000
Z	17.400	14:000	16.100	10.300	0.000	34 000	20,000	007:51	48.00	16,000
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TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANFFILL I/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

BUGR BUGR BUGR BUGR BUGR BUGR BUGR BUGR	Site ID:	PBS-91-61	PBS-91-62	PBS-91-63	PBS-91-64	PBS-91-65	PBS-91-66	PBS-91-67	PBS-91-68	PBS-91-69	PBS-91-70
UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG	ple Type:	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR
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AG 4.170 3.450 - 3.840 4.720 4.350 3.820 4.580 - 3.840 CR 4.350 3.820 4.580 - 3.840 CR 4.350 3.820 4.580 - 3.840 CR 4.350 3.820 4.580 - 3.840 CR 4.350 3.820 4.580 - 3.840 CR 4.350 3.820 11.300 18.600 CR 22.200 29.720 18.200 26.300 25.300 25.300 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15.100 15	PHANTR					ı					
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4.170 3.450 - 3.540 4,720 4,350 3.820 4,580 - 0.735 0.836 - - - - - 0.522 0.507 22.200 29.300 9.720 18.200 25.300 23.800 11.300 18.600 10.200 15.100 21.200 35.500 13.900 15.100 15.100 15.200 12.400 16.800 6.910 11.600 17.800 15.100 6.570 17.200 14.000 22.000 45.000 14.000 22.000 36.000 330.000						•		1	•	ŀ	1
0.735 0.886 - - 0.835 0.781 0.832 0.522 0.507 22.200 29.300 9.720 18.200 26.300 23.800 11.300 18.600 10.200 15.100 21.200 35.500 13.900 15.100 19.000 55.200 12.400 16.800 6.910 11.600 17.800 15.100 6.570 17.200 14.000 22.000 45.000 15.000 36.000 36.000 330.000	AS	4.170	3.450	1	3.840	4.720	4.350	3.820	4.580	,	3.25
22.200 29.300 9.720 18.200 26.300 25.300 23.800 11.300 18.600 10.200 15.100 21.200 35.500 13.900 15.100 19.000 55.200 12.400 16.800 6.910 11.600 17.800 16.200 15.100 6.570 17.200 14.000 22.000 45.000 150.000 14.000 22.000 36.000 330.000	BE	0.735	0.886	•	1	0.835	0.781	0.832	0.522	0.507	0
22.200 29.300 9.720 18.200 26.300 25.300 23.800 11.300 18.600 10.200 15.100 21.200 35.500 13.900 15.100 19.000 55.200 12.400 16.800 6.910 11.600 17.800 16.200 15.100 6.570 17.200 14.000 22.000 45.000 150.000 14.000 22.000 36.000 36.000 30.000	8		•	1	•	ı	,	1	} 1		1
10.200 15.100 21.200 35.500 13.900 15.100 19.000 55.200 15.400 16.800 6.910 11.600 17.800 16.200 15.100 19.000 55.200 17.200 14.000 22.000 36.000 36.000 330.000	8 8	22 200	20.300	9.720	18.200	00t yc	25 300	23.800	11 300	009 81	26.20
12.400 16.800 6.910 11.600 17.800 16.200 15.100 6.570 17.200 14.000 22.000 36.000 330.000	5	10.200	15 100	21 200	35 500	13 900	13,000	15 100	10.00	000 33	20.53
12.400 16.200 6.910 11.600 17.800 16.200 15.100 6.570 17.200 14.000 22.000 36.000 330.000 330.000	E C	1			} : I	20.01			200.71	200	16.10
14.000 22.000 45.000 150.000 14.000 22.000 36.000 330.000	ž	12.400	16.800	6 910	11.600	17 800	16 200	15 100	065.9	17 200	55 77
	. a	14.00	22,000	15 000	000051	00077	22,000	3,500	36 000	330,000	200
	3 3	200:1	1	2021	8 1	2001	1	200.00	20.00	200.000	1
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TABLE 6- 13
SUMMARY OF SURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1; SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID		PRC-01-71	PRC-01-77	PRC-01-73	PRS-01-74	PRS-01-74	PRS-01-76	PRS-01-77	PRC_01-78	PRC. 01-70	PRC-01-80
Sample Type	; :	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR
UNITS		990	990	000	990	000	000	nge	990	000	990
DATE SAMPLED: DEPTH:	PLED:	09/25/91	09/25/91	09/25/91 0.000	09/30/91 0.000	09/30/91	09/30/91 0.000	09/30/91	09/30/91	09/30/91	09/30/91
V0Cs	ACET										t
	C6H6	•	,	1	•	ı	•	,	•	•	•
	CCLJF	ı	ı	ı	•	•	ı	•	0.004 S	S 500'0	1
	MEK		0.006 S								•
SVOCe	2MNAP					0.452					
	24DNT		,	ı	•	1	,	1	1	ı	ł
	Z6DNT	•	1	•	1	1	ı	•	ı	•	ı
	ANAPNE					ı					
	ANAPYL					1					
	ANTRO					1					
	BZEHP					t					
_	BAANTR					0.204					
	BAPYR					1					
	BBFANT					•					
	BGHIPY					1					
-	BKFANT					•					
	CHRY					3.680					
	DBAHA					ı					
	DBZFUR					•					
	DEP					4.010					
	DNBP					1					
	FANT					0.200					
	FLRENE										
	ICDPYR					ı					
	NNDPA					•					
	PHANTR					1.320					
	ב ב					0.108					
	2 4	1		ı	•	, ,	י נ	, 555	, §	, ;	
	2 2	AC8.0	812.0	0.847] [0.887	06.7	3.600	2000	5 5 6	2000
	3 5	9 1	2 1	100	. 1	20.0	()		1000	6.0	1.60
- 10-2)	23.600	22.400	26 200	11 300	10 500	18.900	23 900	25,000	21.500	24 700
	5	16 300	9	15,000	20.300	20.00	24.400	15 400	15 000	17.200	200
	E E	1	1		}	1	') :	1		3
	Z	13.900	18.200	16.500	15.100	19.200	20.700	18.200	16.300	19.500	17.900
	PB	27.000	310.000	32.000	\$5.000	33.000	24.000	20.000	\$8.000	16.000	000 55
	SB	1	ı	ı	1	ı	F	ı	ı	1	
	SE	1	1	,	J	,	1	ı	i		1
	岸	•	1	ı	•	ł	ı	ı	ı	•	1
	ZN	64,100	71.400	76.300	48.900	60.500	40.700	81.100	70.900	90.400	85.000

TABLE 6-13
SUMMARY OF SURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL I/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

			-	60-14-001							
Manage Type:		¥502	#20 2	800 8	8 00 8	BOGK SOCK	BUGR	BUGR	BUGR.	BOCK	
DATE SAMPLED.	'LED:	16/36/61	16/06/60	09/30/91	09/30/91	09/30/91	09/30/91	09/30/91	09/30/91	09/30/91	09/30/91
DEPTIL		0000	0000	0000	0000	0.000	0.000	0.000	0000	0000	0000
VOC.	ACET	ı	ı	ı	,	ı	ı	i	1	ı	
	C6H6	•	1	i	1	ı	ı	1	1	1	
	CCLJF	ı	,	i		•	ı	•	•	•	
	MEK	•		1	•	•	ı	1	•	ı	
SVOC	SMNAP										
	24DNT	f	1	,	1	ı	,	ı		í	
	26DNT	í	,	1	1	;	•	ı	•	1	
	ANAPNE					1					
	ANAPYL					1					
	CALLA					•					
	ROEMP					1 1					
	OT VA VO)					
	27474										
	BAPTR					1					
	BBFANT					•					
	BGHIPY					•					
	BKFANT					•					
	CHRY					•					
	DBAHA					1				5	
	DBZFUR					1				•	
	DEP					ı					
	DNBP					•					
	FANT					1				•	
	FLRENE					1					
	ICDPYR					•				•	
	NNDPA					,				•	
	PHANTR					•					
	PYR					•					
Metals	AG					1	1		-	2.380	
	AS	,	7.700	3,340	1	3.150	•	3.890	1	3.570	
	BE	,	0.640	0.861	0.829	0.578	1	1.510	0.893	•	
	CD	,	ı	•	1	1	,	1	•	, '	
	S	7.150	23.900	23.100	23,600	19.500	15.800	15.300	22.400	23.400	
	5	20.200	29.100	13.700	27.700	13.300	19.400	39.000	14.200	17.200	
	HG	,	1	ı	1	•	1	ł	1	,	
	Z	7.220	21.800	14.800	16.600	14.400	12.400	20.300	17.100	17.700	
	PB	86.000	940.000	23.000	260.000	34.000	150.000	18.000	24.000	110.000	
	SB	ı	ı	1	1	. 1	1	,	,	•	
	SE	•	•	ı	J	1	1	0.629	,	i	
	F	,	ı	•	1	,	,	•	•	ı	
	1								1		

TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELIANT BURNING GROUND/ LANDFILL I/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

PBS-91-100 BUGR UGG 10/01/91 -16.800 52.000 5.860 ----13.300 64.100 1 1 1 . . PBS-91-99 BUGR UGG 10/01/91 3.120 20.900 14.000 16.700 1 1 28.800 PBS-91-98 BUGR UGG 10/01/91 0.000 5.850 0.673 -29.100 15.500 --22.400 83.000 0.606 PBS-91-9 5.160 0.648 26.500 13.600 23.600 60.400 8UGR UGG 10/01/91 0.603 1 1 1 1 PBS-91-96 BUGR UGG 10/01/91 0.000 3.590 --25.200 13.600 --19.000 62.000 70.900 0.731 I I I IPBS-91-95 6.200 GT BUGR UGG 10/01/91 0.000 29.700 25.000 21.800 240.000 9.450 - 200 PBS-91-94 BUGR UGG 10/01/91 0.000 3.930 0.853 0.853 23.800 20.200 12.800 77.400 BUGR UGG 09/30/91 0.000 48.100 168.000 21.700 41.000 2.290 PBS-91-92 79.500 BUGR UGG 09/30/91 21.100 13.500 13.500 20.000 1 1 1 21.800 25.500 -23.400 1200.000 PBS-91-9 BUGR UGG 09/30/91 106.000 1 1 1 1 ANAPNE ANAPYL ANTRC BZEHP BAANTR BAPYR BBFANT BGHIPY CHRY DBAHA DBZFUR FANT FLRENE ICDPYR NNDPA PHANTR PYR ACET C6H6 CCL3F MEK 2MNAP 24DNT 26DNT DEP DATE SAMPLED: DEPTH: Sample Type: UNITS: SVOCS Metals Site ID. **VOC**

Notes and flagging codes are presented at the end of this table.

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TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		PBS-91-101	PBS-91-102	PBS-91-103	PBS-91-104	PBS-91-105	PBS-91-106	PBS-91-107	PBS-91-108	PBS-91-109	PBS-91-110
Sample Type: UNITS:		8 008	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	8008	BCGR CGG
DATE SAMPLED: DEPTH:	ة	10,01/91	10/01/91 0.000	10/01/91 0.000	10/01/91	10/01/91 0.000	10/01/91	09/22/91	09/22/91	3,000	3.000
VOC.	ACET										,
	C6H6	ı	•	•	ı	•	1	1	•	1	,
	CCLJF	•	•	1	•	1	ı	ı	1	•	j
	MEK							•	1	t	,
SVOC. 2	2MNAP					1					
. 4	24DNT	•	1	1	ı	•	1	1		•	ı
. •	26DNT	•	•	•	ı	1	ı	1	1	1	ı
≺	ANAPNE					1					
≺ '	ANAPYL					i					
<u> </u>	ANTRO					1					
	BZEHP					1					
<u> </u>	BAANTR					•					
	BAPYR					1					
<u>ح</u> ة	BBFANT					1					
	BGHIPY					1					
	BKFANT					•					-
	CHRY					1					
	DRAHA					1					
	DRZFUR					1					
1	DEP					6 200 GT					
	DNBP					3					
	FANT					;					-
Ĺ.	FIRENE					•					
. =	a Vac					•					
	MNDPA					ı					
• ā	PHANTR					1					
	PYR					1					
Metals	VG		ı		,	1		1	1	1	
	AS	3.450	3.460	4.750	24.700	•	3.360	3.660	3.810	3.530	3.580
	BE	•	,	•	1	,	1	0.870	1.110	0.917	0.960
	8	•	•	•	,	•	•	•	•	ı	•
	CR	25.300	23.100	26.200	89.800	22.100	21.600	27.400	30.000	22,100	26.900
	D)	10.900	12.900	11.800	217.000	12.900	12.100	13.100	16.400	21.600	23,300
	HG	ı	•	1	3.300	ı	ı	1	0.090	0.160	ı
	Z	17.600	15.400	19.000	63.900	16.000	16.600	16.300	17.400	14.500	15.600
	PB	15.000	23.000	¥.000	130.000	12.000	19.000	19.000	24.000	8.600	13,000
	SB	•	1	1	,	1	•	1	ı	•	•
	SE	1	t	0.591	J		0.581	ı	ı	ı	ı
	7	,	1	•	ı	•	ı	,	•	•	
	ZN	73.400	906.990	\$9.400	188.000	75.600	99.99	\$4.100	79.800	72.400	000.99
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TABLE 6–13
SUMMARY OF SURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sile ID.			711-14-150-1	211-16-20-	*17 - 16 - CO I	100-11-11	011-170-	111111111111111111111111111111111111111	
Sample Type:	ä	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR	BUGR
UNITS		nge	990	000	nge	990	200	000	200
DATE SAMPLED: DEPTH:	PLED	3,500	09/23/91 3.000	3.000	3.000	09/23/91 3.000	3.000	10/01/91 3.000	10/03/91 3.000
VOCs	ACET	•							
) 	C6H6	ı	•	1	ı	•	ı	•	
	CCL3F	,	1	•	ŀ	•	•	i	ı
	MEK	•							
SVOCE	2MNAP	1						1.650	1
	24DNT	,	•	•	,	:		. 1	•
	TMUY	•		1	ı	ı	ļ	,	
	INCOM.	ı	1	1	,	ı)		•
	ANAFRE	1					1	10.900	•
	ANAPYL	ı					1		1
	ANTIRC	ı					•	12.400	i
	BZEHP	•					1	•	•
	BAANTR	1					,	8.900	ı
	BAPYR	ı					ı	3.550	ı
	BBFANT	•					•	3.910	•
	BGHIPY	•					•	2.570	1
	BKFANT	1					•	3.360	,
	CHRY						,	8.280	١
	DBAHA	٠			•		,	0.661	•
	DBZFUR	1						5.800	•
	DEP	•					ı	6.200 GT	6.200 GT
	DNBP	1					1	ı	,
	FANT	1					1	6.200 GT	1
	FLRENE	ı					ı	18.400	ı
	ICDPYR	ı					ı	4.520	•
	NNDPA	ı					1	ŧ	1
	PHANTR	ı					1	12.000 GT	,
	PYR	1					•	6.200 GT	1
Metals	V G	1	,	•	•	ı	ı	ı	
	ΥS	3.390	4.040	5.130	3.100	4.080	6.570	15.400	8.600 8.600
	BE	0.986	1.260	1.460	0.93\$	1.200	0.624	ŀ	0.632
	8	1	1	•		•	ı	1	1
	క	25.100	36.500	40.400	23.800	28.100	30.700	33.500	23.400
	CO	14.500	16.800	21.900	11.200	24.900	18.200	40.000	27.500
	HG	0.071	0.079	1	1	i		0.060	,
	Z	15.700	18.400	21.200	13.700	19.000	23.600	24.500	16.200
	PB	65.000	16.000	15.000	15.000	840.000	20.000	1200.000	1500.000
	SB	1	•	•	1	ı	1	•	ı
	SE	1	1	1	0.585	1	1	ı	
	닏	ı	1	ı	ı	,		ŧ	1
	:	23.600	00707	2000	500.	72.100	66.500		

TABLE 6-13
SUMMARY OF SURFACE SOIL CHEMICAL DATA.
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS AND DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Notes and finguise codes

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncentified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
•	•					•		•	•	•		•		•
ε	3	ner	VOC	SVOC	Blank cell	i	GT	2	9	_	~	S	۲	×

Appendix K contains complete analytical results.

USATHAMA chemical codes are defined in the RI Report Glossary.

TABLE 6-14

SUMMARY OF TCLP METALS DATA FOR SURFACE SOIL PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

	TCLP LEAC	HATE CON	ENTRATION	$(\mu g/l)$	
SAMPLE LOCATION	CD	CR	PB	HG	Notes
TCLP RL'	1,000	5,000	5,000	200	
Minimum Reporting Value	6.8	16.8	43.4	0.1	
PBS-91-03	LT ²	LT	LT	LT	TCLP RL not exceeded
PBS-91-06	LT	LT	7,790	LT	TCLP RL exceeded for P
PBS-91-10	31.2	18.9	100,000	LT	TCLP RL exceeded for P
PBS-91-12	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-15	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-16	LT	LT	6,050	LT	TCLP RL exceeded for P
PBS-91-18	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-21	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-23			-	LT	TCLP RL not exceeded
PBS-91-24	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-27	LT	LT	8,310	LT	TCLP RL exceeded for P
PBS-91-29	LT	LT	1,140	LT	TCLP RL not exceeded
PBS-91-33	LT	LT	2,070	LT	TCLP RL not exceeded
PBS-91-34	LT	LT	1,620	LT	TCLP RL not exceeded
PBS-91-36	LT	LT	910	LT	TCLP RL not exceeded
PBS-91-39	LT	LT	LT	LT	TCLP RL not exceeded
Contaminated Waste Area					
PBS-91-43	LT	LT	315	LT	TCLP RL not exceeded
PBS-91-44	LT	LT	604	LT	TCLP RL not exceeded
PBS-91-45	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-48	LT	LT	28,000	LT	TCLP RL exceeded for P
PBS-91-49	LT	LT	5,730	LT	TCLP RL exceeded for P
PBS-91-52	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-55	LT	LT	LT	LT	TCLP RL not exceeded

W0039213T.6A/12

TABLE 6-14
SUMMARY OF TCLP METALS DATA FOR SURFACE SOIL PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

	TCLP LEAC	HATE CON	ENTRATION	(ng/1)	
SAMPLE LOCATION	CD	CR	PB	HG	Notes
PBS-91-58	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-61	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-65	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-66	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-69	LT	LT	1,130	LT	TCLP RL not exceeded
PBS-91-72	LT	LT	209	LT	TCLP RL not exceeded
PBS-91-75	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-79	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-82	LT	LT	928	LT	TCLP RL not exceeded
PBS-91-85	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-88	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-91	LT	LT	246	LT	TCLP RL not exceeded
PBS-91-95	LT	LT	122	LT	TCLP RL not exceeded
PBS-91-96	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-99	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-102	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-105	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-109	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-112	LT	LT	LT	LT	TCLP RL not exceeded
PBS-91-115	LT	LT	546	LT	TCLP RL not exceeded
PBS-91-116	LT	धा	LT	LT	TCLP RL not exceeded
PBS-91-118	LT	LT	397	LT	TCLP RL not exceeded

Notes:

TCLP Regulatory Level (RLs) exist for the following metals: AS, BA, CD, CR, SE, PB, HG, and AG. However, these results were reported only for CD, CR, PB, and HG. (See List of USATHAMA Chemical Codes for definitions of chemical abbreviations).

LT - Less than the Minimum Reporting Value; corrected for percent moisture, dilution, and percent recovery.

TABLE 6- 15
SUMMARY OF SURFACE SOIL CHEMICAL DATA SETTLING PONDS AND SPOILS DISPOSAL AREA

		=	Final Creek Samples	mples						Se	Settling Pond I Samples	Samples			
Location	FC-1	FC-2	FC-3	FC-4	FC-5	FC-6	FC-7	FC-8	FP1-I	FP1-2	FP1-3	FP1-4	FPI-5	FP1-6	FPI-7
V.	880	14000	5700	12000	2700	1100	10000	3000	21000	18000	1400	27000	10000	14000	23000
Æ															
28	3.6	±	\$	12	3.6	12	27	12	*	31	Š	8	170	22	13
*	A	089	99	920	230	5	78	210	250	720	\$	1100	992	8	901
۷ Z	23	Z	2	180	170	18	90	7.	83	63	11	S	18	110	23
NS	05	\$	41	7	×	41	63	Š	92	43	\$	23	4	\$	88
ZN								•							
BR															
<u>r</u>															
LIN	1.6	8.	=	2.2	1.9	2.4	6.5	4.1	2.5	6.5	0.54		13	3.1	7.
NH3	7.	187	140	25	95	\$	1800	83	99	740	25	380	\$80	300	8
804	101	260	28	Q	S	Q	33	S	Q	Q.	Š	82	2,00	2	Q.
C112CL2															
2,4-DNT	0.2	0.17	•	Q	1.9	Ω	2.1	S	Q	1.9	Ž	Q	0.03	2	Q
26-DNT	5.4	7.0	\$	S	ĸ	1.6	23	S	ND	18	Ş	N	9.1	0.4	a Z
RZEHP															
DEP	Q	Š	0.11	Š	Q	Q	0.13	Š	S	Ñ	Š	Q Q	Q	2	S
DNBP	3.6	3.2	56	Q	Ñ	1.7	7.9	Q	Q	==	19.0	Ş	Q	Q N	0.1
DNOP															
DPA	0.93	0.48	7: 	Q	4.7	0.22	3.5	Q	Q.	3.3	Š	Q	01	0.25	Q
2NDPA	QN	S.	7	S	0.57	Q	0.77	Ž	S	0.97	Ž	Q	Š	Š	Ž
NC	100	440	740	N N	Q	Q.	Q	Q	Q	780	Š	180	00009	Q Q	S
NG															
Ha	1.74	7.79	7.78	7.9	7.55	7.9	6.42	8.03	6.9	6.78	6.88	5.13	6.39	5.32	\$.66
COD	1300	35000	103000	20000	11000	0069	00069	24000	26000	00009	2400	76000	150000	\$1000	38000
201								1							

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TABLE 6~15
SUMMARY OF SURFACE SOIL CHEMICAL DATA SETTLING PONDS AND SPOILS DISPOSAL AREA

Location		ń	ettling Pond	Settling Pond 1 Samples (continued)	ontinued)							ぶ	Settling Pond 2 Samples	2 Samples	
	FPI-8	FPI-9	FP1-10	FP1-11	FP1-12	FPI-13	FP1-14	\$1201	S1202	\$1203	\$1204	FPII-1	FPII-2	FPII-3	\$1205
7	12000	2300	11000	14000	21000	10000	9200		9750	10800	14500	4000	12000	24000	
FE															
28	51	5.1	82	2	13	7	=		92	\$	8	8	8	250	
×	510	160	2 6	420	00 5	380	210					9	370	430	
٧ <u>٧</u>	120	32	150	8	53	21	95					8	£	t	
SN	38	83	45	53	12	33	27		0.45	2.8	1.2	S	23	3	
ZN															
8 8											•				
ಕ															
LIN	13	0.86	6.8	0.83	0.49	0.2	0.26	2			S	=	*	\$	
NIS	230	\$3	150	96	760	73	S					3	760	43	
804	150	S	2000	Q	Q	QN	Q	1300	75	98	\$.	3	S	S	
CH2CL2															-
24-DNT	3	S	2	Q	Q	Q	2			172		2 N	Q	Š	7.6
26-DNT	=	Q	56	NO	0.16	Q	QX					Ş	Š	Š	
BZEHP															-
DEP	QX QX	Q	N	Q	Q	N Q	S			2		£	S	Q.	135
DNBP	7.8	Q	7	1.4	Q.	N	QN			Q		0.74	Q	Q	CX
DNOP															
DPA	QN	Q	v,	Q	0.24	Q	1.3					R	1.5	Q	
2NDPA	0.78	Ä	0.72	Q	æ	Q	2				· · · ·	S	Ð	Ş	
NC	1050	Q	360	S	Q.	Q		00009			336	Š	790	280	
9×															
114	9.9	5.85	7.61	6.54	4.85	6.23	7.08					7.73	7.85	7.19	
COD	77000	0069	45000	\$100	28000	4100	1900					150000	9000	160000	
T0C									ĺ						

TABLE 6-15
SUMMARY OF SURFACE SOIL CHEMICAL DATA SETTLING PONDS AND SPOILS DISPOSAL AREA

				•	THE POPULA	STORES.						
	FPIII-1	FPIII-2	FPIII-3	EPIII-4	FPIII-5 FPIII-6	Epili_6	FPIII_7	CD111_8	CDIII 0	CD111_10	CDITT 11	CB111 112
A L		*	- 1111	-		CLINE O) I III I	reul=0	rrm=2	rcm=10	rem-m	rrm=14
	12000	9500	8800	13000	3100	22000	4400	29000	17000	7600	2800	2900
出												
28	=	6.8	23	8	6.7	2	==	×	7	ଯ	8.1	8.3
×	410	18	9:4	1100	26	06	240	860	830	350	051	9
Y.	£	61	8	130	7	160	67	120	91	51	2	8
NS	77	9 .	52	%	8	32	23	4	32	38	*	\$
NZ												
BR												
ರ												
IN	5.6	0.69	=	7	0.78	4.9	0.91	•	0.39	0.86	0.59	7.
CH2	170	22	8	160	8	\$	12	220	88	33	58	8
204	Ñ	8	Q.	Ñ	2	Q	Q	8	Q	N N	S.	QX
CH2CL2												
24-DNT	Q N	S	Q.	Š	Ž	Q Q	Q	QN	Q.	QN	Q	Q
2,6-DNT	S	Q.	Ž	Š	Ş	Q	S	1.5	Q	2	2	2
ВЗЕИР												
DEP	Q	Q.	S	N O	S	Š	S	Q	Š	S	Š	QX
DNBP	Ñ	17.4	S	¥	6.4	Q	S	∞	N	N	N	2.5
DNOP												
DPA	Q	Q	Š	S	Š	Q	S	2.8	S	Ž	N	7
2NDPA	Q.	Q Q	Ž	ND	Š	S	Š	S	NO	Q Q	S.	S
NC NC	Q.	Q N	æ	Q	Q.	N	S	Q	Q	Q	Š	261
NG												
pH	7.48	6.45	7.37	7.28	7.32	7.4	29.7	7.53	7.15	7.55	7.79	7.73
COD	23000	11000	17000	92000	11000	32000	0006	\$6000	16000	12000	0089	260
100										1		

TABLE 6–15 SUMMARY OF SURFACE SOIL CHEMICAL DATA – SETTLING PONDS AND SPOILS DISPOSAL AREA

	Settling Pond 3 Samples (continued)	3 Samples (a	ontinued)						Š	Settling Pond 4 Samples	4 Samples				
Location	FP111-13	FPIII-13 FPIII-14 FPIII-15	FPIII-15	\$1206	FPIV-1	FPIV-2	FPIV-3	FPIV-4	FPIV-5	FPIV-6	FPIV-7	FPIV-8	FPIV-9	FPIV-10	51207
VT.	16000	34000	13000	1750	23000	17000	21000	34000	23000	18000	00009	12000	24000	1300	19000
丑															
82	72	82	32	ଷ	15	21	#	21	90	8	8	ដ	8	33	291
¥	1300	910	640		1100	1200	1500	1300	870	1200	1500	99	1900	22	
NA NA	9:	==	120		3	270	82	170	130	82	9	\$	38	Š	
NS	62	27	07	3.9	56	43	5.	77	15	3.	\$	\$\$	3	37	Ξ
ZN				,											
eR.															
<u>5</u>															
NIT	0.49	17	3.2	Q		8.0	0.82	0.67	€.4	1.1	10	1.8	 	=	Q.X
NH3	270	1 63	80		310	170	130	330	870	\$20	98	810	\$20	23	
\$0 1	Q	2	QN	15.2	Q	Q	Q	S	90	S	5	Q.	S	Q.Z	183
CH2CL2															
24-DNT	Š	Q	Q.	0.057	Q	2	Q.	Q.	Š	Š	Š	Š	Q	8	QN
26-DNT	Q	2	Q		S	QX	Q	ă	2	Q	Ş	S	Ş	S	
ВЗЕНР															
DEP	Q	Q.	Q	Q	N	Z	Q	Q	Ž	Š	S	Š	Ş	Š	Q.
DNBP	QN.	QN QN	2.6	Q Z	Q	QN	Q	Q	S	Q	Š	S	S	Ž	Q
DNOP															
DPA	Q	0.24	2.2		Q	Q	ND	Q	Q.	Q	Q	Ş	0.36	Q	
2NDPA	ð	Ñ	Q		Ñ	Q.	Q.	Q	Q.	Q	8	S	Ş	Q	
NC	Q	QN	9 .	11	90	Q	Q.	Q	Q.	Q	Ñ	Q N	QN	Q	1038
NG															
рН	7.2	7.32	7.44	-	7.34	7.23	7.28	7.52	7.96	7.39	7.65	7.58	7.63	7.66	
COD	62000	32000	20000		30000	\$1000	Š	.56000	71000	82000	260000	36000	97000	4000	
T0C															

TABLE 6 - 15
SUMMARY OF SURFACE SOIL CHEMICAL DATA SETTLING PONDS AND SPOILS DISPOSAL AREA

Location SDI-1 AL 12487 FE 4162 PB i 42		Sporte Disposed Sinc :			2	Spoils Disposal Site 2	Site 2			S	Spoils Disposal Site 3	d Site 3		
21. 4	SD1-2	SD1-3	SD1-4	SD1-5	SD2-1	SD2-2	SD2-3	SD2-4	SD2-5	SD3-1	SD3-2	SD3-3	SD3-4	SD3-5
	14220	37395	44258	31282	4547	37583	49398	19841	25918	10844	7123	14963	26530	18207
	10902	35401	29418	16535	17231	15534	17348	18674	15950	10623	222	14746	15918	14566
	119	339	75	210	239	326	370	373	567	\$	ぉ	(3	*	85.
•	\$61	\$:	1660	1229	445	266	469	S	437	443	332	577	1327	121
NA 150	8	25	139	26	235	125	123	215	130	146	8	182	139	165
	3.5	3.46	3.68	2.54	1.04	5.6	4.04	2.54	3.68	2.24	1.33	1.36	8.8	1.28
	128	170	212	63	148	220	307	326	748	3 5	119	243	8	126
BR	12		12			→								
CL 15	13	61	±	15	2	77	19	23	92	22	Ξ	=	=	=
NIT 88	6	16	œ	16	∞	01	01	10	80	13	13	=	•	•
NH3														
33	9,	146	98	126	4	83	130	8 0	2.8 2.0	82	31	36	ĸ	R
CII2CL2	0.034	0.0	0.01				0.017	0.012	0.024		0.025			
2.4-DNT 9.8		0.51		12		0.54	1.3	0.84	0.48	0.47		1.1		
2.6-DNT				-					-					
ВЗЕНР				0.35										
DEP														
DNBP 51	0.82	5.4	2.2	ੜ	0.98	3.1	5.8	5.2	3.2	1.6	0.26	•		69.0
DPA 24		2.1	0.3¥	22	0.24	1.5	3.2	1.8	0.79	0.25		1.1		
2NDPA														
NC 11000	0009	9200	8700	10000	6100	2065	7800	8000	2800	2200	850	1400	9;	2000
NG 19														
8.3	8.4	8.3	89.4	8.3	8.3	7.6	œ.3	8.2	8.2	8.1	7.8	8.1	7.6	7.8
COD 12000	23000	32000	22000	43000	48000	46000	40000	44000	0009+	18000	22000	19000	33000	15000
TOC 4100	70000	64000	93000	00095	48000	\$8000	00086	00069	00099	10000	13000	17000	13000	19000

TABLE 6-15
SUMMARY OF SURFACE SOIL CHEMICAL DATA -SETTLING PONDS AND SPOILS DISPOSAL AREA

	0	Spoils Disposal Site 3 (continued)	יייייייייייייייייייייייייייייייייייייי	manus /	_				ก	Spoils Disposal Site 4	1 2010				
Location	SD3-6	SD3-7	SD3-8	SD3-9	SD3-10	SD4-1	SD4-2	SD4-3	SD4-4	SD4-5	SD4-6	SD4-7	SD4-8	SD4-9	SD4-10
AL	13849	11452	11277	11131	15459	11511	20197	17810	16500	17086	12059	18270	20865	18919	20612
E.	14714	11685	13365	12912	15696	13512	16684	15204	16117	15915	13915	16864	19894	18201	17945
22	43	S,	42	63	*	33	ឧ	\$	12	£\$	ន	117	7	130	34
×	1298	473	\$43	445	642	415	059	1195	1535	1250	455	539	1456	1317	1819
Y.	286	Z	167	129	247	115	255	248	130	112	121	86	175	ğ	223
NS	1.58	1.16	2.01	1.74	1.38	0.91	0.65	3.	1.21	1.11	0.8	1.28	0.63	1.31	1.21
ZN	8	139	251	129	186	90	6	130	192	20	ğ	\$	175	<u>∓</u>	175
88															
ช	13	9	13	2	2		9	==	13	2	2	2	=======================================	Ξ	01
NIT	22	٥	12	٥	9	•	12	**	•	-	•	•	e 0	~	=
NII3															
504	33	51	37	31	2	8	8	12	2	56	8	\$	78	139	77
CH2CL2						0.031			0.016			0.01		0.038	1
2,4-DNT	0.83	0.24	0.63						0.7						
26-DNT															
ВЗЕНР									0.32						
DEP															
DNBF	3.6	1.9	2.8	1.2	0.78				\$	0.32		15.0		0.75	
DNOP			,		0.42					0.22	0.63			0.37	
DPA	22	0.46	0.79						1.1						
2NDPA	•														
NC	3200	2400	3800	2900	2000	110		1600	099	230	S 9	1800	33	3000	9
NG															
Hd	7.8	ec	e 0	8.3	••	7.7	6.1	8.2	7.4	7.7	7	7.9	8.6	8.2	7.1
COD	17000	34000	35000	22000	22000	9200	17000	20000	15000	16000	9200	20000	11000	28000	24000
TOC	16000	20000	16000	16000	14000	12000	9100	16000	20000	18000	4600	25000	6100	18000	18000

TABLE 6-15
SUMMARY OF SURFACE SOIL CHEMICAL DATA SETTLING PONDS AND SPOILS DISPOSAL AREA

1945 195-2 195-3 195-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5 197-5				S	Spoils Disposal Site 5	Site 5									
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	TOC	15000	7100	11000	28000	16000	15000	13000	32000	13000	19000	¥	4 100	00086	27900.00

SOURCES:

Ayres Associates, 1984 (FC-.,FP1-,FP2-,FP3-,FP4-)

Envirodyne Engineers, Inc., 1981.(S1201,S1202,S1203) Foth & Van Dyke, 1985.(SD1-,SD2-,SD3-,SD4-,SD5-)

NOTES:

All concentrations are in milligrams per kilogram (mg/kg), equivalent to micrograms per gram (ug/g)

. - Not tested.

ND .. Concentration not detected above instrument Certified Reporting Lim

TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
REMEDIAL I/SETILING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL IINVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Type: UNITS: DATE SAMPLED: DEPTH:	LED:	PBB - 90 - 01 BORE UGG 04/22/90 0.000	FBB - 90-01 PORE UGG 04/22/90 5,000	PBB-90-01 BORE UGG 08/22/90 10.000	PBB - 90 - 01 BORE UGG 08/22/90 15.000	PBB-90-01 BORE UGG 08/22/90 20,000	PBB - 90 - 01 BORE UGG 08/22/90 25.000	788 - 90 - 01 BORE UGG 08/22/90 45,000	FBB - 90 - 01 BORE UGG 06/22/90 70,000	788 - 90 - 01 BORE UGG 04/22/90 AS 000	PBB-90-01 BORE UGG 06/22/90 100.000
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	CHRY DNBP FANT NAP										
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.,.	3889E	17.137	10.858	16.547	3.752 5.528 10.601 7435.939	5.378	3.940	1	16.985	ı	844
	ZZZZ ZZZZZ				285.424 22398.287 216.649 379.441						
<u>.</u>	Z	22.484	i	i	4.732	ı	1	ı	ı	ı	i.
		74.922	14.579	15.167	15.014 90.051	5.479	4.273	3.073	10.072	1	16.642
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parameter parameter	pm(1)										

TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/STITLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site III.		PRR - 40-07	PRR - 40-03	PRR-41-07	PRR-00-07	PRR - 40-07	PRB - 00-03	PRR - 00-03	PRR - 00 - 03	PRE-ON-17	WHH - 60 - 07
Sample Type: UNITS: DATE SAMPLED: DEPTH:	FLED:	BORE UGG 08/23/90 0.000	BORE UGG 08/23/90 5000	BORE UGG 08/23/90 10.000	80RE UGG 08/23/90 15,000	BORE UGG 08/23/90 20,000	BORE UGG 08/23/90 25.000	BORE UGG 08/23/90 45.000	BORE UGG 08/23/90 65.000	BORE UGG 08/23/90 85.000	BORE UGG 04/23/90 95.000
VOC	111TCE 12DCE 13DMB 4E2MHX			1111							
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	MEK MIPK TACLE TXYLEN XYLEN	11	11		1 1	ł t	11	1 1	1 1	1.1	1 1
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*****	SBZ Z Z Z	19.218	I	59777.063 280.985 222.867 7.254	ı	I	I	I	1	ı	1
	≓> <u>₹</u>	81.755	4,400	27.618	6.284	6.152	<u>050.2</u>	4,594	7.282	3.132	7,476
Tadicator	-										
Parameter											

TABLE 6-16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA
BADGER ARMY AMMINETION DIANT

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TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL IINVESTIGATION
BADGER ARMY AMMUNITION FLANT

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TABLE 6- 16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUNE/LANDFILL I/SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL IINVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
READIAL I/SETILING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL IINVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Type: UNITS: DATE SAMPLED: DEPTH:	" PLED:	FBB-91-03 BORE UGG 10/12/91 101.000	PBB-91-04 BORE UGG 10/13/91 8.000	PBB-91-04 BORE UGG 10/13/91 12.000	PBB-91-04 BORE UGG 10/13/91 18.000	PBB - 91 - 04 BORE UGG 10/13/91 22.000	PBB-91-04 BORE UGG 10/13/91 26.000	PBB-91-04 BORE UGG 10/13/91	PBB-91-04 BORE UGG 10/13/91	FBB - 91 - 64 BORE UGG 10/13/91	FBB - 91 - 04 BORE UGG 10/13/91
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TABLE 6– 16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/LANDFILL I/SETILING PONDS AND SPOILS DISPOSAL AREA
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Type: UNITS: DATE SAMPLED:	LED:	PBB-91-04 BORE UGG 10/13/91	PBB-91-04 40RE UGG 10/14/91	PBB-91-04 BORE UGG 10/14/91	PBB - 91 - 04 BORE UGG 10/14/91	PBB - 91 - 04 BORE UGG 10/14/91	PBB - 91 - 04 BORE UGG 10/14/91	PBB-91-05 BORE UGG 10/14/91	PBB-91-05 BORE UGG 10/14/91	PBB-91-05 BORE UGG 10/14/91	PBB - 91 - 65 BORE UGG 10/14/91
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TABLE 6– 16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/LANDFILL I/SETTLING PONDS AND SPOILS DISPOSAL AREA
BADGER ARMY AMMUNITION PLANT

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TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
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TABLE 6– 16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/LANDFILL I/SETTLING PONDS AND SPOILS DISPOSAL AREA
RAMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/SETILING PONDS AND SPOILS DISPOSAL AREA
BADGER ARMY AMMUNITION PLANT

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TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
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ALG AS BA BA BA BA BA CD CD CD CD CD CD CD CD CD CD		240NA 240NA 240NA 350NA ANAPAT BARATR BARATR BARATR BARATR CHRY CHRY FANT NUUETH NUUETH PHANTR	11	1.1	1 (11	11	1.1	12.282	11	6.127	1.1
NI 407.265 350.374 514.730 112.933 5371.520 749.805 265.231 153.511 628.610 SE TT V ZN 1253.935 260.218 1452.920 116.525 2984.426 1017.916 653.906 480.750 1212.498 PB 407.50 1212.498	Act b	<u> </u>	114.998	71.180	197.322	97.551	402.665	327.190	131.348	85.392	106.953	28.767
ZN 1253.935 260.218 1452.920 116.525 2984.426 1017.916 653.906 480.750 1212.498 NIT SO4 PH(1)		Z 2 3 C >	407.265	350.374	\$14.730	112.933	5371.520	749.805	265.231	153.511	628.610	92.437
	Anions Indicator parameter	NESS (I)	1253.93%	260.218	1452.920	116.525	2984.426	1017.916	903:309	480.750	1212.498	206,562

TABLE 6–16
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA—
REMEDIAL I/SETILIAN PONDS AND SPOILS DISPOSAL AREA
REMEDIAL IINVESTIGATION
BADGER ARMY AMMUNITION FLANT

ere III.		. W . B.L. B	90 LOG 140	90 00 Lan	A NO OEN A	BALLOER ANN I AMMONITON FLAN	IN STANT			8	
Sample Type: UNITS: DATE SAMPLED: DEPTH:	red:	PIT UGG 09/06/90 4.000	1917 1966 0:06690 1000	PIT UGG 09/06/90 5.000	PIT PIT UGG 09/06/90 2,000	BORE UGG 08/21/90	BORE UGG 08/21/90 5,000	BORE UGG 10000	BORE UGG 04/21/90	BORE UGG 0421/90	BORE UGG 0421/90
VOC.	111TCE 12DCE 13DMB 4E2MHX ACET							1 6 F 1			
	CHSCL2 CHSCL2 ETC6HS MEC6HS	ı	i	0.645	ı	1	1		1	•	1
	MEK MIBK TCLEE TRCLE TXYLEN XYLEN	1.1	1 1	1 1	11	1 1	1.1	1111 1	1-1-	1 1	11
SVOCe	ZMINA ZADNI ZADNI ZADNI ZADNI	1 1	11	1 1	1 1	1 1	1 3	1111	1 1	1 1	1 1
	BAANTA BAANTA BBFANT BGHIPY BKFANT										
	CHRY FANT NAP					•					
	NNDPA PHANTR PYR							111			
Metals	248 28 28331	22.834	,	12.361	71.696	110.899	488.008	30495.701 36.880 241.121 0.559 31202.166 2.689 11.437 11.44.12	15.609	118.876	116.329
	THY WENT BE	18.027	10.944	153.023	8.5<8	62.851	873.744	45145,002 0.059 1336,502 27876,725 854,897 948,819 95,355 1343,194	1	ı	1
	5 구 > X	134.809	10.912	138.026	349,359	450.891	1342.148	- 55.698 1695.162	15.924	35.092	95.95.
Anions	E S										
Indicator	pH(1)										

TABLE 6– 16
PROPELLANT BURNING GROUND/ LANDFILL I/SETLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL II/SESTIGATION
RADGER ARMY AMMUNITION PLANT

Site ID: Sample Type:		LOB-90-01 BORE	LOB-90-01 BORE	LOB-90-01 BORE	LOB-90-02 BORE	SPB-91-01 BORE	SPB-91-01 BORE	SPB-91-01 BORE	SPB-91-01 BORE	SPB-91-01 BORE	SPB-91-01 BORE
DEPTH:	PLED:	08/21/90 67,000	08/21/90 86.000	06/21/90	08/21/90 0.000	10/14/91	10/14/91	19/14/91 19/14/91 12/000	16/14/91 22/14/91	19/4/91 19/4/91 19/4/91	10/14/91
VOCE	HITCE					. 1	1	ı	ı	1	1
	13DNB 13DNB					i	ı	ı	ı	ı	ı
	ACET					ı	1	ı	1	1	1
		,	1	,	ı		1 1			1 1	0.00
	CHICLI					ı	1	ł	i	1	1
	MECGHS					1 1	: 1	1 1		1 1	1 1
	MEK						•	•	1	1	0.004 S
	TCLEE	,	•	•	ı		1 1	1 1		1 1	
	TACLE	•	ı	1	1	ı	ı	ı	1	1	1
	XYLEN					t	1	•	ı	ı	•
SVOC	ZMINA					•				1	
	26DNT		1 1				1 1	1 1	1 1	1 1	1 1
	YNDS					1	•	i	1	ı	1
	ANAPYL					0.1 6 6		•	1	ı	ı
	BAANTR					0.185	ı t		; 1	} 1	1 1
	BBFANT					0.70 51.70	•	1	•		,
	BKFANT					0.018			1 1		1 3
	CHRY					0.264	ı	ı	ı	: 1	1
	PAN PA	,				-040	1 (1 1		1	1
-	Ž Z	•				È I	1 1		1 1	1 1	1 1
	NBOETH NND BA					•					
	PHANTE					0.173		1 1			1 1
	PYR					0.487	1		, j.		•
Metals	\$					21600.000	8050.000	2710.000	2510,000	1360.000	1300.000
	SS &					14.140	114.000	1 300		•	1
	(B)					0.813	200.411	ODC: 10	007	1 1	1 1
_	5 8					000.000	2130.000	1180.000	1090.000	3.500.000	30200.000
	පිරි					8.480 23.900	ં છ ે	3.330	90.9	2 680	1691
	:SE	15.257	4.465	4.691	103.108	23300,000	Ş	7180,000	5.890 000 0089	2610 000	8.330
	E.					23.0		900 384	23.000	230,000	200.0.00
	,OZ					3570.000	1310.000	65.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	1170,000	1970.000	25,000
	Y.					79.300	100:000	90.400	132.000	20.90	000
	ZZ	ı	1	1	73.211	15.900 18.000	7.220 10.000	5.940 2.150	6.890 2.770	1.030	3.270
	풍근					2.140	16.500	17.000	0.156	1 1	1.1
	> Z	10.128	5.983	3,110	108.713	62.000 67.000	46.000 28.000	14.000	16.000 10.300	7.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00	19.000 0.340
Anions	HN FOS					3.530 18.200	3.460	35.800	2.770	066.1	017°
Indicator	pH(I)					0.067	8.310	7.160	8.050	006.6	0.00
parameter											

TABLE 6-16 SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

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unitless	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Resul's based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits	
				•	•			•	•				•	
Ξ	n er	,00 ,00	\$VOC	Stank cell		5	•	_G	•	~	**	L	Ų	

USATHAMA chemical codes are defined in the RI Report Glossary.

Appendix K contains complete analytical results.

TABLE 6-17
SUMMARY OF TCLP METALS DATA FOR SUBSURFACE SOIL PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

		TCLP LEA	CHATE CON	CENTRATION	(Vg/1)	
SAMPLE LOCATION	D EPTH	CD	CR	РВ	HG	Notes
TCLP RL ¹		1,000	5,000	5,000	200	
Minimum Reporting Value		6.8	16.8	43.4	0.1	
PBB-91-01	16	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-01	105	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-02	27	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-02	102	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-03	4	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-03	101	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-04	18	LT	LT	122	LT	TCLP RL not exceeded
PBB-91-04	72	LT	LT	95.2	LT	TCLP RL not exceeded
PBB-91-04	102	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-04	107	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-05	73	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-05	111	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-06	6	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-06	12	9.5	LT	1,460	LT	TCLP RL not exceeded
PBB-91-06	14	10.1	LT	167	LT	TCLP RL not exceeded
PBB-91-06	20	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-06	31	LT	LT	LT	ĻT	TCLP RL not exceeded
PBB-91-06	41	LT	22.8	LT	LT	TCLP RL not exceeded
PBB-91-06	61	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-06	91	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-07	6	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-07	8	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-07	10	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-07	12	LT	LT	LT	LT	TCLP RL not exceeded

W0039213T.6A/14

TABLE 6-17 SUMMARY OF TCLP METALS DATA FOR SUBSURFACE SOIL PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		TCLP LEA	CHATE CON	CENTRATION	ι (μg/1)	
SAMPLE LOCATION	DEPTH	CD	CR	PB	HG	Notes
PBB-91-07	20	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-07	32	LT	LT	LT	LT	TCLP RL not exceeded
PBB-91-07	62	LT	LT	LT	LT	TCLP RL not exceeded

Notes:

TCLP Regulatory Level (RLs) exist for the following metals: AS, BA, CD, CR, SE, PB, HG, and AG. However, these results were reported only for CD, CR, PB, and HG. (See List of USATHAMA Chemical Codes for definitions of chemical abbreviations).

LT - Less than the Minimum Reporting Value; corrected for percent moisture, dilution, and percent recovery.

TABLE 6-18 SUMMARY OF SUBSURFACE SOIL CHEMICAL DATA FROM PREVIOUS PROGRAMS -SETTLING PONDS

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

						3	MPLE	FNS	MPLE IDENTIFICATION AND DEPTH	NAND	DEPT	_								
-	Settlin	Settling Pond 1		Settling Pond	_		Settling Pond 1	1 Pd 1		Settling Pond 1	Pond 1		Settling Pond 2	12		Settline Pond 3	ond 3		Settline Pon	7
		S1201		\$1202			S1203			81204			S1205			S1206	-		\$1207	
ANALYTE	ğ	IS.	ä	38.	150.	ğ	36.	16ft.	9	38	Sft. 19ft.	ğ	0.6ft.	15ft.	ğ	0.6ft.	15ft.	8	0.66	15ft.
24DNT		0.109		199	LT0.099	12	17.1	0.27		0.719	0.024	900	1.57	LT 0.0089 0.057	0.057	2.61	2.61 LT 0.0089		LT0.0089	LT 0.0089
AL Se		1 T 3 0	93.6	1 T 10	1720	1980	1 T 3 O	1720	14500	1.730	Ţ.	3750	ŀ		1750		i	19000		
		LT 40		1340	1340 LT 4.0	9	18	11		2	17.5	LT 4.0 LT 4.0	135 LT 4.0		2 9 5 1	4 1 30 LT 30	17.50		17.50	17.0
o S	866								336						0.17			1030		
NO3	0.889								LT 0.889			LT 7.15			LT7.15			3.4 1 T 0.880		
2			8			\$\$			180			8			ឧ		_	165		
3	,		\$	_		2.8			1.2			4.7			3.9					
ğ	1370		3			198			58.2			20.2			15.1			183		

USATHAMA IRDMIS SOURCE

NOTES:

LT - Less Than
 All units are 19/8
 Blank spaces indicate that the sample was not analyzed for the analyte.
 Blank spaces indicate that the sample was not analyzed for the analyte.
 Sample depths are likely incorrect; the Envirodyne Report indicates that two samples were taken from each boring: approximately null to 15 ft, and 15 ft. to 30 ft.
 This table represents all available data contained in the IRDMIS for Site ID's S1201 through S1207.

TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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488 574 593 6.02 498 554 600 595		pH(1)	7.4	6.5	7.4	6.2	7.6	6.1	7.8	5.9	7.4	6.5
	- •	Sp.Cond.(2)	989	57.5	593	8	867	† 55	909	265	979	612

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TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUIND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		PRM-	PBM-85-01	PBM-	PBM-85-02	PRM-84-03	44-03	PRM-AS-04	15-04	PRM	PBM-85-05
Sample Type:	ü	3 =	WELL	WE	WELL	WELL		WELL	1 ,	WE	WELL
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parameter	_	408000	420000	382000	400000	446000	443000	392000	420000	408000	446000
	TDS	476000	495000	447000	391000	487000	467000	479000	451000	475000	46,1000
	pH(I)	7.6	7.1	7.6	6.5	7.5	5 .9	7.7	\$.°9	7.3	0.9
	Sp.Cond.(2)	702	159	701	701	737	766	754	732	783	778

TABLE 6–19
SUMMARY OF GROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETILING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6–19
SUMMARY OF GROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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\$36 611 637 581 667 679 506 655 639		oH(1)	7.4	7.7	7.3	7.6	7.3	6.9	7.5	7.3	3.5	7.5
		Sp.Cond.(2)	\$36	611	637	581	199	629	905	559	636	35

TABLE 6– 19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELIANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		PBN	PBN-82-02A	PBN-8	PBN-82-02B	PBN-82-02C	2-02C	PBN-82-03A	2-03A	PBN-82-03B	12-03B
Sample Type: UNITS:		> -	WELL UGL	W.	WELL UGL	WELL	11:	WELL	1 :	WELL	12
DATE SAMPLED: ROUND:	PLED:	12/04/91 ONE	04/08/92 TWO	12/05/91 ONE	04/08/92 TWO	12/05/91 ONE	04/08/92 TWO	11/22/91 ONE	04/09/92 TWO	11/24/91 ONE	04/09/92 TWO
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	IIDCLE	i	1	ı	ı	ı	•	1	ı	ı	1
	13DMB	1	1	ı	ı	ı	,	ı	1	1	1
	ACET	1	ŧ	1	1	ı	ı	ı	1	•	1
	C6H6	ł	•	1	1	ı	ı	1	ı	ı	1
	CCL	11.8	14.7	17.6	13.7	2.35 P	1	Ā.	53.9	11.8	16.7
	CH2CL2	5.39	6.86 B	4.31 P	S.88 B	4.12 P	5.98 B	3.92 P	5.49 B	4.41 P	P 1.2
	CHCL3	3.92	ı	3.62	0.694 P	£5" †	3.92	4.12	\$.63	1.31	1.1
	MEC6HS	ı	1	ı	1	ı	1	ı	ŧ	ı	ı
	MEK	1	1	ı	1	ı		ì	ı	1	ı
	TCLEE	i	1	ł	ı	1	1	1	1	1	ı
	TUSTE	84.9	8.66	117	98.7	96.6	4.56	5.4	5.52	7.9	6.79
SVOC	TNC197		1	ı	ı	ı		ı	1	ŧ	1
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	NO3										
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	204	32000	33000	30000	32000	38000	39000	28000	27000	30000	29000
Indicator	ALK	310000	315000	312000	335000	244000	232000	287000	297000	292000	301000
parameter	HARD	432000	394000	384000	386000	341000	364000	334000	320000	334000	336000
	TDS	429000	411000	126000	445000	416000	395000	324000	3, ,000	407000	348000
	pH(1)	7.4	0.9	7.4	9°9	7.5	\$ 9	4.7	S.7	7.7	7.3
-	p.Cond.(2)	21./	150	01/	/70	#7.	600	2.48	8	31/	611

TABLE 6–19
SUMMARY OF GROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		PBN	PBN-82-03C	PBN-	12-04A	PBN-8	2-04B	PBN	PBN-82-04C	NBA	PBN-82-05A
Sample Type:	ë	3 -	WELL	Ā	WELL	WE	WELL	WE	WELL	¥	WELL
DATE SAMPLED: ROUND:	MPLED:	11/24/91 ONE	04/09/92 TWO	12/07/91 ONE	04/26/92 TWO	11/22/91 ONE	04/26/92 TWO	11/22/91 ONE	04/26/92 TWO	12/05/91 ONE	04/13/92 TWO
VOCs	IIITCE	1	1	'	9.8	1	ı	ı	ı	43.9	49.4
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	IIDCLE	•	ŀ	1	ı	,	1	,	ı	•	ı
	13DMB	,	•	ı	•	1	1		,	1	•
	ACET	1	1		ı	ı	ı	1	•	ı	•
	C6H6		ı	1	•		•	1.76 P		,	ı
	7700	2.55 P	2.2 P	30.4	42.2	2.0 P	2.75 P	2.4 P	2.75 P	73.5	92.2
	CH2CL2	4.02 P	6.08 B	8.69	6.57 B	4.12 P	6.18 B	3.82 P	6.08 B	\$.39	6.67 B
	CHCL3	1.01	0.483 P	191	4.63	4.73	4.73	4.23	5.03	5.03	5.23
	MEC6HS		1	1	ı	1	i	ı	1	•	ı
	MEK		ı	ı	1	•		•	1	1	١
	TCLEE	1	ı	ı	1	•	1	ı	ı	1	1
	TRCLE	1	1.91	15.9	13.8	4.1	4.88	4.7	5.2	64.8	63.7
SVOC	26DNT	1	1	1	ı	. 1	1	ı	ı	0.839 P	ı
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	700	42000	73000	42000		42000	42000	41000	42000	W009	
Tadiostor	AIK	TOOTIL	OUO5CL	314000	:	280000	282000	283000	286000	MOCE	15,8000
		70000	382000			170000	368000	342000	380000	10000	47,2000
		449000	40800	365000		373000	407000	388000	401000	000065	465000
	i i	7.7	7.3	2		7.6	7.2	7.5	7.2	-	0 9
	Sa Cond (2)	109	200	•		. S	60	3	885	2	717
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TABLE 6–19
SUMMARY OF GROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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Sample Type: UNITS: DATE SAMPLED: ROUND: VOCs 111TCE 11DCE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCLE 11DCL	12/08/91	WELL UGI.	WELL	WELL	WELL	크	WELL	ᆲ	WELL	∄ ;
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Sp.Cond.(2)	(2)	98	733	969	714	349	729	\$88	602	995.

Page 8 of 20

TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		NBA	PBN-85-04A	PBN-	PBN-89-01B	PBN	19-01C	PBN-8	PBN-89-01D	PBN-89-02B	9-02B
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	pH(1)	7.2	0.9	7.1	7.2	7.5	7.2	* 0	7.5	1.7	7.5
	Sp.Cond.(2)	726	713	701	339	672	357	688	320	682	95.

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TABLE 6–19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL I/ SETTIJNG PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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Site ID:		PB	PBN-89-04C	PBN	PBN - 89-04C	-N84	PBN-89-10A	PBN-89-10B	9-10B	PBN-89-10C	19-10C
Sample Type:	*		WELL	W	WELL	WE	WELL	WELL	7	WELL	1
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	700	20.5	58.6	ጵ	27.5	22.5	30.4		2.45 P	ı	
	CH2CL2			4.31 P	6.37 B	•	7.75 B	4.12 P	6.76 B	3.53 P	6.96 BB
	CHCL3	3.24	6.83	9.0	5.03	2.82	1.81	3.22	151	1.21	3.12
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Indicator	ALK			316000	342000	328000	356000	250000	256000	254000	276000
parameter	HARD			406000	428000	380000	444000	364000	354000	328000	348000
	108			45:000	452000	447000	449000	420000	409000	276000	393000
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Page 11 of 20

TABLE 6 - 19
SUMMARY OF GROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTIJING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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parameter	HARD	364000	356000	376000	396000	390000	420000	380000	398000	344000	380000
•	TDS	431000	391000	23000	428000	\$13000	403000	44 1000	407000	433000	389000
	pH(1)	7.5	7.6	7.2	7.5	7.4	7.6	8.0	7.8	9. 1	7.7
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TABLE 6– 19
SUMMARY OF GROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL I/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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	700	34.3	19.6		65.5	10.8	35.3	2.2 P	2.2
	CH2CL2	S.1 P	7.25 B	4.51 P	6.86 B	4.22 P	7.75 B	3.92 P	S
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parameter	HARD	-	416000	366000	414000	396000	406000	370000	367000
	TDS	•	401000	455000	436000	477000	429000	491000	40.4000
	pH(1)	7.8	7.4	7.9	7.7	7.2	S. 9	7.7	7.5
	Sp.Cond.(2)	ı	265	099	365	ž	639	846 846	635

TABLE 6– 19 SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL I/ SETTLING PONDS AND SPOILS DISPOSAL AREA REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Site ID:		ГОМ	LOM-91-02	LON-	LON-89-02A	TON-8	9-02B	LON-89-03A	9-03A	K0-68-NOT	19-038
Sample Type:	1:	} =	WELL	A.	WELL	WELL	3 =	WELL	1;	WELL	WELL
DATE SAMPLED: ROUND:	PLED:	12/13/91 ONE	04/22/92 TWO	12/07/91 ONE	04/22/92 TWO	12/07/91 ONE	04/22/92 TWO	12/07/91 ONE	04/22/92 TWO	12/07/91 ONE	04/22/92 TWO
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	CH2CL2	4.12 P	6.08 B	5.29	S.98 B	S.0 P	5.39 B	S.1 P	S.69	4 13	7.35 8
•	CHCL3	0.543 P	0.956	1.51	1.1	1	2.11	1.31	0.03	•	0.755 P
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TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELIANT BURNING GROUND/ LANDFILL I/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TABLE 6– 19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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CHCL1 Still Gold 13.3 9.78 7.85 8.25 3.52 1.91 2.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.82		CH2CL2	5.2 P	7.35 B			3.53 P		3.92 P		3.53 P	6.76 B
THCK 1.59 2.44 2.22 1.96 0.55 4.7 2.44 2.23 2BUXEL 2.23 51 2.24 2.22 1.96 0.55 4.7 2.44 2.23 2BUXEL 2.23 51 2.24 2.22 1.96 0.55 4.7 2.44 2.23 2BUXEL 2.23 51 2.24 2.23 2.44 2.23 2BUXEL 2.23 51 2.24 2.23 2.44 2.23 2BUXEL 2.23 51 2.24 2.23 2.44 2.23 2BUXEL 2.23 31.4 4.7 36.6 2B E		CHCL3	5.13	6.04	13.3	9.78	7.85	8.25	3.52	1.91	2.82	3.82
THCLE 159 2.44 2.22 1.96 0.95 0.892 4.7 2.44 2.23 SEINTE 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.81 2.8		MEK	•				•	•	1	•	1	1
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CR 8.94 - 13 - 7.61 FE - - - 2.2 - 1.51 - 7.61 FE - - - - 2.2 - 4.25 - 4.25 K 799 T 1480 T - - - 4.25 - - 4.25 MM - - - - - - - 4.25 MN - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		පි	ı				•	•	1	1	•	•
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MN - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		MG	43000	41000			41000	42000	22000	41000	49000	49000
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SO4 \$000 \$000 \$000 \$1000 X \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 \$1000 <th></th> <th>ರ</th> <th>15000</th> <th>17000</th> <th></th> <th></th> <th>18000</th> <th>1900</th> <th>20000</th> <th>36000</th> <th>20000</th> <th>21000</th>		ರ	15000	17000			18000	1900	20000	36000	20000	21000
ALK 266000 230000 35000 35000 352000 352000 HARD 347000 368000 374000 384000 430000 38600 374000 TDS 395000 304000 41500 411000 45500 440000 403000 PH(1) 7.5 7.3 7.6 7.4 7.4 7.5 7.4 7.5 Sp.Cond.(2) 631 643 600 706 632 605		804	20000	20000			23000	X 000LS	47000	48000	\$2000	S8000 X
HARD 347000 368000 374000 384000 43000 386000 374000 TDS 395000 304000 41500 411000 45500 44000 403000 pH(1) 7.5 7.3 7.5 7.4 7.4 7.2 7.4 7.5 Sp.Cond.(2) 631 686 531 643 600 706 632 605	Indicator	ALK	266000	230000			292000	260000	336000	298000	352000	320000
395000 304000 40000 40000 40000 40000 40000 7.5 7.3 7.5 7.4 7.4 7.2 7.4 7.5 631 557 686 531 643 600 706 632 605	parameter	HARD	347000	368000			374000	384000	430000	386000	374000	426000
7.5 7.3 7.5 7.6 7.4 7.4 7.2 7.4 7.5 6.3 6.05 6.05 6.05		TDS	39.5000	304000			415000	411000	45,500	440000	403000	461000
631 557 686 531 643 600 706 632 605		pH(1)	7.5	7.3	7.5	7.6	7.4	1.4	7.2	7.4	7.5	7.4
		Sp.Cond.(2)	631	253	989	S31	£3	909	3 06	632	\$ <u>0</u> 9	5 79

Notes and flagging codes are presented at the end of this table.

TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTIJNG PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

4					-		-		455	0.000	272
Site ID:		SPN-89-05	A-0-4	3FN - 89 - USB	# CO - CO	SPN-91-02D	02D	3FR-91-05D	- USD - 1	040-141-040 4/51 1	
UNITS		žă	VGL.	TON	<u>بر (</u>	ner	يبر ا	DO.	<u> </u>	100	j , ,
DATE SAMPLED:	PLED:	_	04/24/92	_	•	_	04/29/92		•	12/13/91	04/29/92
ROUND:		ONE	IWO	ONE	0.81	ONE	0*1	ONE	OM1	ZIO C	OM!
VOCs	13DMB	ı	1	1	ı	t	1	ŧ	ı	i	1
	ACET	1	1	ı	ı	ı	í	1	ı	ı	1
	25	,	1	ı	ı	•	3.14 P	11.8	78.4	ı	•
	CH2CL2	4.22 P	6.76 B	4.51 P	7.55 B	3.33 P	7.16 B	S.0 P	6.67 B	3.33 P	6.96 B
	CHCL3	: 1	1	1.01	1	•	2.92	1.31	2.52	ı	ı
	MEK	1	•	1	ı	ı	•	6.9 S	1	12 S	•
	TRCLE	1	;	ı		•	1	1	0.584	•	0.775
SVOC	2BUXEL										
	ZEIHXL					ν. 88		> 5		\$	4
	BZEHF	, ,			9,2	7.75	7:10	V	0.70	74.4	2 2
Metals	V 1	39.5 X	23	33.8	50.0 V	32.3	4.4.4	¥.07	8.67 200		\$
-	3	1		1	,		0.374	1	0.397		
	ర	92000	78000	16000	81000	•	77000	84000	89000	70000	98000
	9	•	ı	•	ι	•	•	1	ı	1 ;	ı
	S S	9.66	1	10.3	ı	7.28	ı	J.		22	•
	5	4.87	•	5.88 88.		ı	ı		6.78	• }	+
	딾	ı	•	1	1	28.8	ı	30.5	ı	25.5	X
	¥	1000 T	1170 T	1320 T	1600 1	811 T	1980 T	356 T	20 4 0	J 69/	2000 T
	MG	25000	23000	32000	34000	•	41000	43000	42000	3,000	3 4000
	M	0001	90,	•	1	•	1	•	•	96 5.	570
	ž	1	14000 T	3000 T	F 0069	3110 T	13000 T	i	11000 T	2610 T	12000 T
	Z	10.3	•	ı	1	E	•	1	ı		•
	2	1	•	1	1	1	9.01	•		•	ı
	>	1	•	ı		1		•	1	•	ı
	ZN	162		238 X	1	ı	•	1	•	1	1
Anions	LN	095	1300	3400	4600	3400	0094	0059	\$200	1100	,
	ರ	12000	11000	10000	12000	9700	11000	11000	14000	0099	7600
	204	38000	39000	29000	30000	42000	44000	00089	70000	21000	× 00065
Indicator	ALK	267000	264000	260000	242000	256000	276000	268000	296000	278000	262000
parameter	HARD	310000	298000	314000	318000	300000	356000	376000	40000	282000	320000
	ZOT	34,5000	319000	327000	348000	369000	376000	425000	445000	472000	347000
	pH(1)	7.4	7.5	7.5	7.5	7.6	7.8	7.6	7.4	7.6	7.3
	Sp.Cond.(2)	767	6	957	\$3\$	389	284	3	878	445	3

and the c

Notes and flagging codes are presented at the end of this table.

TABLE 6-19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION

	\$1105
	\$1104
RMY AMMUNITION PLANT	\$1103
BADGER AR	\$1102
	\$1101

Sample Type: UNITS: DATE SAMPLED:	È	19/11/61	WELL WELL UGL	SING WELL UGL	02 1.1. it. 0473487	S1103 WELL UGL		WE WE	Silot Well Ugl		SI 105 WELL UGL
ROUND		ONE	TWO	ONE	TWO	ONE	TWO	ONE	F	TWO	
VOC	13DMB	ı	ı	ı	i	ı	1		•		
	ACET	ı	1		1	1	t	•	•		
	7100	1	1	•	•	8.9	4.51	1	1		ı
	CH2CL2	4 0.8	5.88 B	4.41 P	6.18 B	4.41 P	6.27 B	4.71 P	7.65	6	B 4.12 P
	CHCL3	1	1	1	1.21	1	•	1	ŀ		1
	MEK	8.0 S	ŀ	•	ì		t	1	•		1
	TRCLE	•	•	1	1	ı	0.329 P		1		
SVOC	2BUXEL							8 0.9			
	ZEIIIXL										
	BZEHP			•		1	40 P	•	-		1
Metals	BA			35.3	36.7	41.2 X	34.6	33	30.9		95.
	BE			ı	0.453	ı	ı	•	1		•
	Š			100000	97000	00066	84000	81000	71000		85000
	0				i	•	ı	3.61	ı		,
	క			10.1	1	12.9	ı	9.91	1		9.50
	25			4.89	ı	5.82	4.92	ı	ı		•
	Ħ			6.99	ı	25.8	45.7	ı	ı		i
	×			1280 T	1470 T	890 T	7 1	793 T	836 T		1470 T
	MG			25000	24000	23000	40000	31000	27000		26000
	Z			1	ì	1	ı	•	ı		*
	¥			19000 T	27000 T	i	23000 T	Z090 T	2420 T		2870 T
	Z			•	•	1	1	•	•		ı
	7 B			1	ı	1	1		1		,
	>			1	ı	5.01	11.5	ŧ	1		•
	Z			1	1	320	ı	ı	1		1
Asions	TIN	2100		00/9	6300	7100	00%	4200	2300		\$100
	ರ	140000		27000 P	27000 P	26000 X	27000 P	2400 P	2700		4800
	SO4	21000		46000	49000	\$2000	X 0000S	28000	26000		33000
Indicator	ALK			320000	320000	304000	309000	278000	30000	ì	288000
parameter	HARD			380000	387000	380000	392000	334000	326000		340000
,	SCE			347000	451000	419000	427000	373000	345000		371000
	(1)[1]	7.3	7.3	7.3	8.9	7.2	7.3	7.4	7.4		7.3
	Sp.Cond.(2)	916	538	622	969	672	\$92	9	3.		\$16

.

Notes and flagging codes are presented at the end of this table.

TABLE 6-- 19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: UNITS: DATE SAMPLED: 12/13/91 ROUND: 0NE VOCA 111TCE - CCL4 - CCL4 - CCL2 CCL3 - CCL3 - CCCL3 - CCCL3 - CCCL3 - CCCL3 - CCCL3 - CCCL3 - CCCCL3 - CCCCCCCCCC	WELL		WELL	نے	WELL	. =	WELL	:=	WELL	· +.
LED: 111TCE 11DMB ACET CCL4 CCL4 CCL4 CCL4 CCL4 CCL4 CCL4 CCL			ב		21]	21	ł <u>.</u>	2	_
IIITCE ISDMB ACET CCL4 CCL4 CHCL3 MEK TRCLE 28UXEL 28UXEL 28UXEL CCA CCA CCA CCA CCA CCA CCA CCA CCA CC	<u> </u>	04/23/92 T-WO	12/13/91 ONE	04/25/92	12/13/91 ONE	04/23/92	12/12/91	04/22/92	11/24/91	04/11/92
HITCE HIDDAB ACET CCL4 CCL4 CCL4 CCL4 CCL4 CCL4 CCL4 CCL		A	7.17	X	4110	Z	Z.V.Z.	X	NA.	2
13DMB ACET CCL4 CCL4 CHCL3 CHCL3 CHCL3 CHCL3 CHCL4 CHCL4 CHCL4 CHCL4 CHCL5 CHCL5 CHCL4 CHCL5 CHCL5 CHCL7 CHCL6 CHCL7 CHCL7 CHCL6 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCL7 CHCT CHCL7 CHCT CHCT CHCT CHCT CHCT CHCT CHCT CHC									3.29 P	241
ACET CCL4 CCL4 CHCL3 MEK TRCLE 28UXEL 28UXEL 28UXEL 28UXEL CC CA CCA CCA CCA CCA CCA CCA CCA CCA C		ı	,	ı	•				1	1
CCL4 CHXCL2 MEK TRCLE 28UXEL 28UXEL 26.HXL BY BY BY CC CC CC CC CC CC CC CC CC CC CC CC CC		,	,	1	,	1			,	1
CHCL3 CHCL3 MEK TRCLE 28UXEL 28UXEL 28UXEL CEHYL BE CA CCA CCA CCA CCA CCA CCA CCA CCA CCA			,	1	•	1			13.7	16.7
CHCL3 MEX TRCLE 2BUXEL 2E1HXL 8EHP BA BA CA CA CD CR CA CD CR CM CM CM CM CM CM CM CM CM CM CM CM CM	a. ~	7.16 B	3.24 P	7.25 B	4.61 P	67.75 B	4.31 P	7.65 B	4.61 P	5.78
MEK TRCLE 2BUXEL 2BUXEL 2BUXEL 2BINEH BA BB CA CA CA CA CA CA CA CA CA CA CA CA CA		0.915	3.62	,	,	ı		1	2.52	2.31
TRCLE 28UXEL 28UXEL 28UXEL 28UXEL 28UXEL CBHP BA BA BA BC CA CA CA CA CA CA CA CA CA CA CA CA CA		,	,	1	1	,			,	1
2BUXEL 2E1HXL B2EHP BA BA BC CA CC CC CC CC CC CC CC CC CC CC CC CC		1	-		1				11.7	10.6
BEHP BE CA CC CC CC CC CC CC CC CC CC CC CC CC										
BA BB BA BB BB BB BB BB BB BB BB BB BB B		,								
M M M M M M M M M M M M M M M M M M M		31.5 P	31.5 P		1	1			28.0 P	1
		33.1	4	43.6 X	2	130	\$	S		
		•	,	0.408	١.	0.348				
	8	71000	75000	78000	82000	83000	96000	00006		
			,	,		•			1	1
	ø	1	6.23	ı	4.93	ı	7.8	,	9.16	1
		1	,	ı	ı	ı	ı	6.91		
		,	7.7	•	3 ,	448	33.4	1		
	-	1030 T	E00	836 T	546 T	1310 T	672 T	1040 T		-
	8	34000	31000	31000	12000	13000	47000	45000		
		ı	,	1	1700	1700				
Z	+	12000 T	,	24000 T	1	21000 T	1	11000 T		
		ı	ı	1	ı	ı	•	ı		
1 20 3		ı	,	ı	ı	12	1	ı	ı	ı
^			,	ı	ì	•		19.0		_
NZ.				•	1	1	'	1		
_	2	400	2800	1800	•	ł	21000	18000	3800	3200
	8	1,5000	32000 P	4 1000	29000 P	25000 P	21000 P	25000 X	38000	39000
204	8	28000	13000	11000	62000	× 00009	26000	26000	2000	83000
	8	220000	260000	310000	178000	186000	312000	273000	306000	316000
_	8	296000	292000	304000	214000	276000	380000	395000	392000	288000
TDS 321000	8	315000	343000	348000	379000	336000	415000	40000	444000	400000
	5	7.8	7.3	7.5	7.1	7.1	7.3	7.4	7.7	0.9
Sp.Cond.(2) 447	7	203	389	581	314	396	474	628	622	Š

Notes and flagging codes are presented at the end of this table.

TABLE 6–19
SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL I/SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: WELL UGL UGL UNITS: WELL UGL UGL UGL UGL UGL UGL DATE SAMPLED: 12/10/91 04/23/92 VOCs 13DMB	04/2/92 TWO TWO 0.775 P	WELL UGL 04/12/92	WELL	.	WELL	<u>د</u> تا ه	ā ≯	WELL
LED: 12/10/91 UGL 13/10/91 UGL 13/10/91 UGL CHCL3 0.634 P MEK TRCLE 28/UXEL 2E/HXL BZEHP BA 31.4 BE CA 74000 CD 3.43 CU CR 6.4 CU FF 27.8 K 895 T MG NN NN NN NN NN NN NN NN NN NN NN NN NN		UGL 04/12/92	ner	, נ	OI.			
SAMPLED: 12/10/91 (0) 13DMB	04/23/92 TWO TWO 1	04/12/92			2	نــ	ă	
Jadaba ACET CCLA CCLA CCHCL3 0.634 P CHCL3 0.634 P MEK TRCLE ZBUXEL ZEHKXL BA 31.4 BA 31.4 BE	8.14 B 0.775 P	Ē	-	04/26/92	_	04/24/92	-	04/25/92
ACET CCL4 CCL4 CCHCL3 CCHCL3 CCHCL3 CCHCL3 CCHCL3 CCHCL4 CCHCL4 CCHCL3 CCHC C CCC CCC CCC CCCC CCCC CCCC CCCC	8.14 B 0.775 P	2	ONE	TWO	ONE	TWO	ONE	TWO
CCL4 CCL4 CHCL3 CH2CL2 CH2CL3 CH3 P CHCL3 CH3 P CHCL3 CH3 P CHCL3 CH3 P CH2CL4 61 P CH2CL3 CBC P CBC CBC CBC CBC CBC CBC CBC CBC CBC CBC	8.14 B	,	1	1	ł		ı	١
CCL4 CHCL2	8.14 B	1	1	ı	i	•	i	1
CH2CL2 4.61 P MEK TRCLE 28UXEL 28UXEL 28UXEL 28UXEL CE 14000 CD 3.43 CR 6.4 CU - 14000 CD 3.43 CR 6.4 CU - 14000 CD 3.43 CR 8.95 T MG 3.4000 MN - 11000 NA - 11000 CD 2.20000 CD 2.20000 CD 2.20000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000 CD 3.4000	8.14 B 0.775 P	35.3	1	ı	ı	1	i	
CHCLJ 0.634 P MEK TRCLE 2BUXEL 2BUXEL 2BUXEL 2BUXEL CA 74000 CA 74000 CD 3.43 CR 6.4 CU - 27.8 K 895 T MG 34000 MN - 11000 NA - 11000 CD 2.20000 CC 2.20000	0.775 P	3.53 P	4.22 P	6.08 B	3.73 P	7.35 B	3.63 P	4.78 B
MEK TRCLE 2BUXEL 2BUXEL 2E1RXL BZEHP BA 31.4 BB		3.72	t	0.503 P		·		
TRCLE 2BUXEL 2E1HXL BEHP BA 31.4 BE	,	1	1	1	1	1	ı	ı
2BUXEL 2EIIXL BEHP		4.99	ı	ı	ı	ı	ı	ı
BA 314 BA 314 BA 314 BA 314 BC CA 74000 CD 3.43 CCU							8.0 S	
BA 31.4 BA 31.4 BA 31.4 BE CA 74000 CD 3.43 CR 6.4 CU								
BA 31.4 BE	ı	49.4 P	ı	ı	1	,	ı	ŧ
BE CA 74000 CD 3.43 CR 6.4 CU CU CU CU CU CU CU CU CU CU CU CU CU	33.8		24.1	30.4	61	- 26	35	35.3
CA 74000 CCR 6.4 CCU 6.4 CCU 7.8 K 895 T MG 34000 MN 7 NA 7 V 7 CL 20000	1		,	ı	ŧ	1	ı	,
CR 6.4 CR 6.4 CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU CU	87000		9000	00059	89000	84000	82000	72000
CR 6.4 CU	•		ı	1	ı	1	1	,
CU			8.11	1	8.03	,	5.35	ı
FE 27.8 K 895 T MG 34000 MN NA	16.9		7.68	•	7.28	6.24	6.47	6.33
MG 34000 MN NA NA NI V ZN CL 20000	1		33.1	1	61.6	29.7	1	*
MG 34000 MN NA NA NI ZN ZN CL 20000	1340 T		1170 T	2060 T	1570 T	T 0961	1080 T	1440 T
MN NA NA NA NA NA NA NA NA NA NA NA NA NA	41000		35000	34000		37000	38000	34000
NA	1		ı	,		1	ı	,
NI PB V ZN NIT 11000 X CL 20000	14000 T		22000 T	78000 T	ı	\$0000 T	16000 T	24000 T
PB	,		ı	ı	1	i	1	1
ZN NIT NIT SOURCE	ŧ		8.49	ı	,	,	i	11.8
ZN - 11000 X CL 20000	16.6		1	1	•	•	1	ı
CL 20000	•		1		ı	ı	ı	1
20000	9200	3800	9700	3800	9700	3000	4800	3800
000127	24000	18000	27000 P	00069	75000	\$8000	38000	625000 P
90,50	39000	27000	37000	43000	48000	41000	46000	37000
259000	290000	298000	258000	238000	322000	318000	224000	364000
311000	356000	324000	302000	312000	341000	360000	290000	322000
38,5000	411000	325000	377000	413000	477000	437000	485000	189000
7.5	7.6	0.0	7.2	7.6	7.2	7.4	7.6	7.7
	620	512	1 09	£18	669	753	775	\$89

TABLE 6 – 19
SUMMARY OF CROUNDWATER CHEMICAL DATA—
PROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BAD! FR ARMY AMMUNITION PLANT

316 10:		SIS	S1152A	SIISZB	2B
Sample Type:		M	WELL	WELL	크_
DATE SAMPLED: ROUND:	PLED:	12/11/91 ONE	4/25/92 TWO	12/11/91 ONE	04/25/92 TWO
VOCs	13DMB	2.4 S		•	ı
	ACET	ı	ı	ı	,
	700	ı	1	,	2.55 P
	CH2CL2	4.51 P	5.98 B	4.41 P	6.27 B
	CHCL3	1	1	•	ı
	MEK	•	ı	1	1
	TRCLE	•	1	ı	1
SVOC	2BUXEL 2E1HXL				
	BZEHP	28	1	1	40.3 P
Metals	BA	75	6/	J .	98
	BE	1	0.54	1	0.373
	5	120000 X	110000	110000	98000
	9	1	1	•	•
	క	7.19	•	7.39	1
	25	8.32	ı	7.51	7.14
	표	127	155	53.4	27.1
	¥	1250 T	1370 T	1350 T	1630 T
	MG	35000	32000	28000	27000
	M	11.2	ı	•	•
	ž	ı	17000 T	18000 T	24000 T
	Z		•	1	•
	£	ı	ı	7.4%	1
	>	,	,		ı
	ZN	1900	182	250	8.99
Anions	FZ	8400	. 0019	8700	0089
	ರ	26000 P	25000 P	31000 P	30000 P
•	204	\$1000	23000	47000	49000
Indicator	ALK	328000	320000	284000	334000
parameter	HARD	44000	388000	370000	358000
	SQL S	487000	479000	445000	441000
	pH(1)	8.3	7.4	8.0	7.6
	Cond (2)	ž	ş	741	529

TABLE 6-19 SUMMARY OF GROUNDWATER CHEMICAL DATAPROPELLANT BURNING GROUND/ LANDFILL 1/ SETTLING PONDS AND SPOILS DISPOSAL AREA REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

Meter not functioning	Purged dry	unitless	Specific conductivity, unhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits	
M					•			•									
•	:	Ξ	(3)	ngr	VOC	SVOC	Blank cell		ಕ	82	9	۵.	~	S	1	×	

USATHAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results.

Propellant Burning Ground/Landfill 1/Settling Ponds and Spoils Disposal Areas^a CHEMICAL AND PHYSICAL PROPERTIES OF MAJOR ORGANIC CONTAMINANTS -TABLE 6-20

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

		MOLECUAR	DENGITY	WATER SOLUBILITY	VAPOR PRESSURE	HENRY'S LAW CONSTANT	1 1 2	֓֞֞֜֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓
CHEMICALS	CASE	WEIGHT (g/mote)	(g/mt)	(2/ 6 w)	(mmrg)	(eth-m/mote)	K. (mt/g)	(mt/mt)
Volatile Organic Compounds								
C6H6	71-43-2	8/	0.8786	1.75x10³	95.2	5.58×10 ⁻³	88	132
CCL4	56-23-5	154	1.594	7.57×10 ²	8	2.41×10 ⁻²	110	437
CHCL3	67-66-3	119	1.483	8.2x10 ³	150.5	2.88×10 ⁻³	4	2
111TCE	71-55-6	133	1.32	1.50×10³	123	1.44×10 ⁻²	152	316
TRUE	79-01-6	132	1.45	1.10x10 ³	57.9	9.10×10³	126	240
X) LEN	1330-20-7	901		1.98x10 ²	10	7.04x10 ⁻³	240	1.82x10³
(ortho)	95-47-6	901	0.88	1.75x10 ²	10			8.91×10 ²
(meta)	108-38-3	901	0.864	1.30×10 ²	01			1.82×10³
(para)	106-42-3	106	0.86	1.98×10 ²	01			1.41×10³
Semivolatile Organic Compounds	≅ I							
24DNT	121-14-2	182	1.32 (CRC)	2.40×10 ²	5.10×10³	5.09×10 ⁴	45/250 (HO)	1.29×10 ⁵ 100
26DNT	606-20-2	182	1.28 (CRC)	1.80×10²	1.80×10 ⁻²	3.27×10 ⁴	26	<u>6</u>
NNDPA	96-30-6	198	1.23 (CRC)	1.13×10²	6.3Ex10 ⁴	1.4×10°	650 (ADL)	1.35x10³ (ADL)

Notes:

A All data from the Risk Assessment Guidance for Superfund (USEPA, 1989a) unless otherwise noted: ADL = Arthur D. Little, 1985; CRC = CRC Handbook of Chemistry and Physics

(Weast, 1960-81); and HO = ${\rm Ho}_1$ 1988. K. = partition coefficient between the organic chemical and carbon. K. = partition coefficient of the chemical between octanol and water. See the List of USATHAMA Chemical Codes in the Glossary for definitions of chemical abbreviations.

TABLE 6-21 COMPOUNDS OF POTENTIAL CONCERN PROPELLANT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	EXPOSURE POINT	CONCENTRATION
COMPOUND OF POTENTIAL CONCERN	Surface Soil ¹ (<i>u</i> g/g)	SUBSURFACE SOIL
24DNT	10.7	58.9
26DNT	1	2
2MNAP	0.452	18.2
ANAPNE	•	16.9
ANAPLY	•	1.04
ANTRC	-	12.4
AS	9.45	18.8
B2EHP	6.2	6.2
BAANTR	0.204	8.9
BAPYR	•	3.55
BBFANT	•	3.91
BGHIPY	-	2.57
BKFANT	•	3.36
C6H6	0.42	9.09
CHRY	3.68	8.28
CR C	49.8	40.4
CU	344	327.19
DBAHA	•	0.661
DBZFUR	•	5.8
DEP	6.2	6.2
ONBP	6.35	6.2
FANT	0.2	. 6.2
FLRENE	•	18.4
lG	0.334	-
CDPYR	· -	4.52
MEC6H5	-	14.4
NAP	•	6.2
NI .	27.3	-
TIN	•	35
NNDPA	30.8	12
РВ	2700	1200
PHANTR	1.32	12

W0039213T.6A/16

TABLE 6-21 COMPOUNDS OF POTENTIAL CONCERN PROPELLANT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	EXPOSURE POINT	CONCENTRATION
COMPOUND OF POTENTIAL CONCERN	Surface Soil ¹ (//g/g)	SUBSURFACE SOIL ² (µg/g)
PYR	0.168	6.2
SE	0.618	1.77
SO4	•	280
TRCLE	•	0.23
TXLEN		39.5
ZN	1040	1253.94

Notes:

- = Not identified as a compound of potential concern. Exposure point concentrations is the 95th percentile concentration.

 μ g/g = micrograms per gram; equivalent to parts per million (ppm).

Assessment of surface soil contamination was performed using samples PBS-91-01 through PBS-91-108. In addition, the upper portions of samples PBS-91-109 through PBS-91-114 were used to assess contamination of surface soil by 24DNT, 26DNT, C6H6, and CCL3F.

Assessment of subsurface soil contamination from 0 to 12 feet was performed using data from the following borings, test pits, and surface soil samples: LOB-90-01, LOB-90-02, PBB-90-01, PBB-90-02, PBT-90-01 through PBB-91-07, and the deeper samples from PBS-91-109 through PBS-91-118.

TABLE 6-22 SUMMARY OF RISK ESTIMATES PROPELLANT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	Exposure Route	CANCER RISK	HAZARD INDEX
Current and Future Grounds Maintenance Worker	Soil Ingestion	2x10 ⁻⁶	0.005
	Inhalation of particulates and vapors	2x10 ⁻⁸	0.0000002
	Total for Grounds Maintenance Worker	2x10 ⁻⁶	0.005
Future Residential	Soil Ingestion	8x10 ⁻⁵	0.8
Future Farmer	Soil Ingestion	1x10 ⁻⁵	0.02
	Inhalation of Particulates and Volatiles	<u>7×10⁻⁵</u>	<u>0.03</u>
	Total for Farmer	8×10 ⁻⁵	0.05
Future Construction Worker	Soil Ingestion	2×10 ⁻⁶	0.8
	Inhalation of Particulates and Volatiles	1x10 ⁻⁷	0.00007
	Total for Construction Worker	2x10 ⁻⁶	0.8

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TABLE 6-23
COMPOUNDS OF POTENTIAL CONCERN SETTLING PONDS AND SPOILS DISPOSAL AREA

							EXPOSURE P	EXPOSURE POINT CONCENTRATION - (49/6)	TRATION - (c	(0/0,					
	FINAL	FINAL CREEK OUTFLOW	FINAL CREEK	S. P.	SETTLING POND 1	SET POI	SETTLING POND 2	SETTLING POND 3	UMO D 3	SETTLING POND 4	SPOLS DISPOSAL ANEA 1	SPORE DISPOSAL ANSA 2	SPOLE DISPOSAL ANEA 3	SPOLS DISPOSAL ANEA 4	SPORES DISPOSAL ANEA S
COMPOUND OF	SUR.	Sue.²	Sun.³	Sun.	, ens	SUR.	SUB.7	Sun.	9.8°	Sur.16	Sun."	8UA. ¹²	SUR. 13	Sun. 14	8 .48
24DNT	-	•	9	172	17.1	7.6	0.04	2.6	0.057		12	1.3	1.1	0.7	
26DNT	-	:	40	26	1	-	ı	1.5	ı	:	-	1	-	,	
ZNNOPA	:	1	2	0.97	1	:	ı	1	:	ı	1	1	·	٠	
AL	;	1	ţ	1	:	-	1	-	-	000'09	,	1	:	1	
ANAPYL	0.166	1	:	:	-	;		1	:	٠	1	·	,		
82ЕНР	1.02	ı	!	1		;	,	1	-	:	0.35	-	:	0.32	
BAANTR	0.185	ı	:	:	-	:	3	:	:	:	-	:	1	;	ļ ;
BBFANT	0.723	1	;	-	:	1	1	1	:	,	ı	t	,	1	
ВСНІРУ	0.618	1	:		-		,	-		;	1	1		,	
BKFANT	0.635	1	;	1	ł	1	1	-	1	:	,	:	1	;	
BB	ı	:	1	ı	;	1	1	1	ı	:	12	4		1	16
CH2CL2	;	1	ī	:	-	-	1	ı	,	;	0.034	0.024	0.025	0.038	0.026
CHRY	0.264	;	,	,	,	1	;	•		;	•	1	1		:
ಕ	;	;	:	;	ì	;	·	1		·	19	23	11	13	192
DEP	-	:	0.13	460	1,340	135	:	44	-	1	ı	;	ı		:
DNOP	;		82	7	;	0.74	1	17.4	1		51	5.8	4	4.4	6.5

continued

TABLE 6-23
COMPOUNDS OF POTENTIAL CONCERN SETTLING PONDS AND SPOILS DISPOSAL AREA

							EXPOSURE P	EXPOSURE POINT CONCENTRATION - (ug/g)	TRATION - (10/0/					
	FINAL	FWAL CREEK OUTFLOW	FINAL CREEK	38. P.C	BETTLING POND 1	SET	SETTLING POND 2	SETT	SETTLING POND 3	SETTUNG POND 4	SPOILS DISPOSAL AREA 1	SPOILS DISPOSAL AREA 2	SPOLS DISPOSAL ANEA 3	SPORE DISPOSAL ANEX 4	Brous Dierosau Area 6
COMPOUND OF	SUR.1	Sus.²	Sun. ³	SUR. ⁴	SuB.	SUR.	Sus.	Sun.ª	Sus.	SUR.16	BUR.11	SUR.12	6UM. 13	8. IA	#. 5
DNDP	1	1	2	1	•		•			1	8.6	:	:	0.63	0.2
OPA	2	:	15	10		1.5	1	2.8	-	1	54	3.2	2.2	1.1	2.4
FANT	0.407	1	1	1	-		:	-			1	1	1	:	ı
HG	0.505	:	:	1	-	1	1	ı	**	1	**	:	ı	:	,
NC	:	ı	740	60,000		280	:	190	0.17	1,038	11,000	8,000	3,800	3,000	11,000
NG	,	:	:	ı	:	1	-	•		•	19	-		:	
NH3	1	1	1,800	740	:	840	:	520	1	096	1	1	1		;
FIX	3.53	3.76	11	13	:	43	1	4.9	•	10	16	10	22	12	5 2
РВ	:	:	40	981	;	250	;	:	1	300	349	373	29	120	102
PHANTR	0.173	:	1	t	:	1	•	-	1	-	,	ı	:	:	;
РУЯ	0.487	1	ı	1	:	,	:	1	1	-		1	٠	;	; ; ;
SN	'		83	57	·	ន	4.7	72	3.9	77	3.68	4.04	5.8	1.64	1.94
804	18.2	35.8	260	2,500		25	20.2	36	15.2	400	146	130	75	139	88

SETTLING PONDS AND SPOILS DISPOSAL AREA COMPOUNDS OF POTENTIAL CONCERN -TABLE 6-23

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

							EXPOSURE P	EXPOSURE POINT CONCENTRATION - (ug/g)	TRATION - (4	(8/6)					
	FINAL	WAL CREK OUTFLOW	FINAL CREEK	SEI Pog	SETTLING POND 1	SET POR	SETTLING POND 2	SETTLING POND 3	1940 5 3	SETTUNG POND 4	SPOKS DISPOSAL AREA 1	SPOILS DISPOSAL AMEA 2	BPORE DISPOSAL AREA 3	BPORE DISPOSAL AREA 4	SPOLS DISPOSAL ANEA 6
CONCEND OF	Sun.	Sus.2	Sun.²	Sun.*	Sus.	SUR.	SUB.	SUR.ª	SUB.	SUR.16	Sun."	\$UR.12	8UR.13	SUR.14	#. #S
NZ	1	1		ı	1		1	•	1	1	212	748	251	204	306

Notes:

- Subsurface data available only for Final Creek Outflow, Settling Pond 1, Settling Pond 2, and Exposure point concentration is the maximum concentration detected Settling Pond 3.
 - = not identified as compound of potential concern
- μg/g = micrograms per gram; equivalent to parts per million (ppm) Sur. = Surface Sub. = Subsurface
- Assessment of surface soil contamination (0 to 2 feet) was performed using data from boring SPB-91-01
 - Assessment of subsurface soil contamination (2 to 12 feet) was performed using data from boring SPB-91-01.
- Assessment of surface soil contamination (0 to 2 feet) was performed using data from Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples FC-1 through FC-8.
- Assessment of subsurface soil contamination (2 to 16 feet) was performed using data from samples FPI-1 through FPI-14, and S1201 through S1204.
 - Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples S1201 through S1204.
 - Assessment of subsurface soil contamination (2 to 16 feet) was performed using data from samples FPII-1 through FPII-3 and S1205.

- Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples FPIII-1 through FPIII-15 and S1206.
- Assessment of subsurface soil contamination (2 to 16 feet) was performed using data from
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples FPIV 1 through FPIV-10 and S1207.
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples S01-1 through SD1-5.
 - Assessment of surface soil contamination (0 to 2 feet) was performed using samples SD2-1 through SD2-5. =
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples from SD3-1 through SD3-10. 2
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples from SD4-1 through SD4-10.
 - Assessment of surface soil contamination (0 to 2 feet) was performed using samples from SD5-1 through SD5-10.

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Final Creek Outflow			
Current and Future Grounds Maintenance Worker	Soil Ingestion	4x10 ⁻⁷	0.0002
	Inhalation of Particulates and Vapors	2x10 ⁻¹¹	0.0000004
	Total Grounds Maintenance Worker	4x10 ⁻⁷	0.0002
Future Residential	Soil Ingestion	2x10 ⁻⁵	0.03
Future Construction Worker	Soil Ingestion	7×10 ⁻⁸	0.01
	Inhalation of Particulates and Volatiles	4x10 ⁻¹⁰	0.0009
	Total Construction Worker	7x10 ⁻⁸	0.06
Final Creek			
Current and Future Grounds Maintenance Worker	Soil Ingestion	1x10 ⁻⁶	0.0004
	Inhalation of Particulates and Vapors	ND	ND
	Total Grounds Maintenance Worker	1x10 ⁻⁶	0.0004
Future Residential	Soil Ingestion	5x10 ⁻⁵	0.06
Settling Pond 1			
Current and Future Grounds Maintenance Worker	Soil Ingestion	5x10 ⁻⁶	0.008
	Inhalation of Particulates and Vapors	<u>ND</u>	<u>ND</u>
	Total Grounds Maintenance Worker	5x10 ⁻⁶	0.008
Future Residential	Soil Ingestion	2x10 ⁻⁴	1.0
Future Construction Worker	Soil Ingestion	7x10 ⁻⁷	0.006
	Inhalation of Particulates and Volatiles	<u>ND</u>	ND
	Total Construction Worker	7x10 ⁻⁷	0.006

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Settling Pond 2			
Current and Future Grounds Maintenance Worker	Soil Ingestion	2x10 ^{.7}	0.0004
	Inhalation of Particulates and Vapors	ND	ND
	Total Grounds Maintenance Worker	2x10 ⁻⁷	0.0004
Future Residential	Soil Ingestion	8×10 ⁻⁶	0.06
Future Construction Worker	Soil Ingestion	3×10 ⁻⁸	0.004
	Inhalation of Particulates and Volatiles	<u>ND</u>	_ND
	Total Construction Worker	3x10 ⁻⁸	0.004
Settling Pond 3			
Current and Future Grounds Maintenance Worker	Soil Ingestion	9x10 ⁻⁸	0.0002
	Inhalation of Particulates and Vapors	ND	_ND
	Total Grounds Maintenance Worker	9x10 ⁻⁸	0.0002
Future Residential	Soil Ingestion	4x10 ⁻⁶	0.03
Future Construction Worker	Soil Ingestion	1x10 ⁻⁸	0.002
	Inhalation of Particulates and Volatiles	<u>ND</u>	_ND
	Total Construction Worker	1x10 ⁻⁸	0.002
Settling Pond 4			
Current and Future Grounds Maintenance Worker	Soil Ingestion	ND	0.00002
	Inhalation of Particulates and Vapors	<u>ND</u>	ND
	Total Grounds Maintenance Worker	ND	0.00002
Future Residential	Soil Ingestion	ND	0.003

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Spoils Disposal Area 1			
Current and Future Grounds Maintenance Worker	Soil Ingestion	3x10 ⁻⁷	0.0009
	Inhalation of Particulates and Vapors	ND	ND
	Total Grounds Maintenance Worker	3x10 ⁻⁷	0.0009
Future Residential	Soil Ingestion	1×10 ⁻⁵	0.1
Spoils Disposal Area 2			
Current and Future Grounds Maintenance Worker	Soil Ingestion	3×10 ⁻⁸	0.0004
	Inhalation of Particulates and Vapors	ND	ND
	Total Grounds Maintenance Worker	3×10 ⁻⁸	0.0004
Future Residential	Soil Ingestion	1×10 ⁻⁶	0.06
Spoils Disposal Area 3			
Current and Future Grounds Maintenance Worker	Soil Ingestion	3x10 ⁻⁸	0.0002
	Inhalation of Particulates and Vapors	ND	_ND
	Total Grounds Maintenance Worker	3×10 ⁻⁸	0.0002
Future Residential	Soil Ingestion	1×10 ⁻⁶	0.03
Spoils Disposal Area 4			
Current and Future Grounds Maintenance Worker	Soil Ingestion	2x10 ⁻⁸	0.0002
	Inhalation of Particulates and Vapors	ND	_ND
	Total Grounds Maintenance Worker	2×10 ⁻⁸	0.0002
Future Residential	Soil Ingestion	8x10 ⁻⁷	0.02

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Spoils Disposal Area 5			
Current and Future Grounds Maintenance Worker	Soil Ingestion	7x10 ⁻¹²	0.0002
	Inhalation of Particulates and Vapors	ND	_ND
	Total Grounds Maintenance Worker	7x10 ⁻¹²	0.0002
Future Residential	Soil Ingestion	3x10 ⁻¹⁰	0.03

Notes:

ND = Not determined - no toxicity values available for compounds of potential concern.

Table 6-25 Companison of Groundwater to Standards Units: $\mu g/t$ Propellant Burning Ground/Landfill 1/Settling Ponds and Spoils Disposal Area

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND OF POTENTIAL	FREQUENCY	MAXIMUM DETECTED	MINIMUM DETECTED	SDWA (1)	(1)	WI GROU STAND	WI GROUNDWATER STANDARDS (2)	CALCULATED
CONCERN	DETECTION	CONCENTRATION	CONCENTRATION	MCL	MCLG	ES	PAL	<u>e</u>
111TCE	14:94	59.3	2.52	200	200	200	40	
26DNT	6:188	1.46	0.839	•		0.05	0.005	
ВА	70:70	130	24.1	2,000	2,000	1,000(c)	200(c)	٠
BE	11:70	0.582	0.348	•		•		0.05
CCL4	123:197	108	1.86	ĸ	0	ß	0.5	
9	3:120	3.61	2.8	ĸ	S	10(d)	1(d)	
CHCL3	132:197	83.5	0.483	•	•	ဖ	9.0	,
ر ا	187:187	140,000	2,400	250,000(a)	•	ı	ı	•
S.	57:120	46.6	4.93	100	100	50(e)	5(e)	
CO	29:70	23.1	4.58	E	1,300	,		•
HG	2:120	4.31	2.83	8	8	8	0.2	
××	9:70	1,700	11.2	50(a)	1	50(f)	25(f)	,
¥ Z	48:70	94,000	2,090	20,000(b)		ı		ı
LIN	178:185	21,000	140	10,000	10,000	10,000	2,000	
NNDPA	16:186	25	0.955	·	,	ı		20
PB	18:120	13.6	5.54	E	0	50(g)	5(g)	
SO4	179:179	637,000	1.5	250,000(a)	•	250,000(f)	125,000(f)	•
TRCLE	124:197	117	0.329	S	0	5	0.18	

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COMPARISON OF GROUNDWATER TO STANDARDS UNITS: Mg/1 **TABLE 6-25**

PROPELLANT BURNING GROUND/LANDFILL 1/SETTLING PONDS AND SPOILS DISPOSAL AREA

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

COMPOUND OF POTENTIAL CONCERN	FREQUENCY OF DETECTION	MAXIMUM DETECTED CONCENTRATION	MINIMUM DETECTED CONCENTRATION	SDWA (1)	A (1)	WI GRON STAND	WI GROUNDWATER STANDARDS (2)	CALCULATED CONCENTRATION (3)
:				MCL	MCLG	ES	PAL	
>	10:70	19.1	5.01	•	•	•	•	260
ZN	11:70	1,900	29	•	•	5,000(f)	2,500(f)	7,300

Souces:

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- U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards." Office of Water, Washington, D.C., August 1991, "Fact Sheet: National Secondary Drinking Water Standards." Office of Water, Washington, D.C., September 1991; and EPA, 1990, "National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule Rule," 57FR31776, July 17, 1992 (see Subsection 3.6 for details).
 Wisconsin Administrative Code, Chapter NR 140.10, Table 1 (see Subsection 3.6 for details).
- Calculated to be protective at risk of 10° or HI of 1 (see Subsection 4.5 for details). ର ଡ

- Secondary drinking water standard, suggested level.
- Reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet.

 - WI proposing change to ES = 2,000 $\mu g/t$ and PAL = 400 $\mu g/t$ WI proposing change to ES = 5 $\mu g/t$ and PAL = 0.5 $\mu g/t$
 - Wi proposing change to ES = 100 µg/t and PAL = 10 µg/t
- Values are for protection of public welfare (usually aesthetic concerns) rather than for protection of public health **3 9 9 9 9 9**
 - Will proposing change to ES = 15 µg/t and PAL = 1.5 µg/t
 - micrograms per liter
 - Safe Drinking Water Act
- Maximum Contaminant Level
- Maximum Contaminant Level Goal

- Enforcement Standard
- Preventive Action Limit ₽ E
- Treatment technique requirement in effect Copper action level - 1,300 µg/2

TABLE 6-26 ECOLOGICAL CONTAMINANTS OF CONCERN^A PROPELLANT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION®
Surface Soil ^C		
24DNT	16:114	10.7
2MNAP	2:13	0.452
AS	83:108	9.45
B2EHP	1:13	6.2
BAANTR	1:13	0.204
C6H6	8:114	0.42
CHRY	1:13	3.68
CR	108:108	49.8
CU	108:108	344
DEP	7:13	6.2
DNBP	4:13	6.35
FANT	2:13	0.2
HG	31:108	0.334
NI	108:108	27.3
NNDPA	3:13	30.8
PB	108:108	2,700
PHANTR	3:13	1.32
PYR	1:13	0.168
SE	10:108	0.618
ZN	108:108	1,040

Notes:

A Constituents selected based on criteria presented in Table Q-5 and discussed in Section 5.0.

 $^{^{}f s}$ 95th percentile or maximum; unite in $p{
m g}/{
m g}$

C Assessment of surface soil contamination was performed using samples PBS-91-01 through PBS-91-108. In addition, the upper portions of samples PBS-91-109 through PBS-91-114 were used to assess contamination of surface soil by 24DNT, 26DNT, C6H6, and CCL3F.

TABLE 6-27 ECOLOGICAL CONTAMINANTS OF CONCERN^A FINAL CREEK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION®
Surface Soil ^C		
PB	8:8	40
SN	7:8	63
NIT	8:8	11
NH3	8:8	1,800
SO4	4:8	260
24DNT	5:8	6
26DNT	6:8	40
DEP	2:8	0.13
DNBP	5:8	26
DPA	6:8	15
2NNDPA	3:8	2
NC	3:8	740

Notes

^A Constituents selected based on criteria presented in Table Q-6 and discussed in Section 5.0.

 $^{^{8}}$ 95th percentile or maximum; units in μ g/g.

^c Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples FC-1 through FC-8.

TABLE 6-28 ECOLOGICAL CONTAMINANTS OF CONCERN^A SETTLING POND 1

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION ⁸
Surface Soil ^c		
PB	16:17	180
SN	17:17	57
NIT	14:16	13
NH3	14:14	740
SO4	8:18	2,500
24DNT	5:15	172
26DNT	6:14	26
DEP	1:15	460
ВР	6:15	14
DPA	6:14	10
2NNDPA	3:14	0.97
NC	7:15	60,000

Notes:

^A Constituents selected based on criteria presented in Table Q-7 and discussed in Section 5.0.

^{• 95}th percentile or maximum; units in μ g/g.

Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples FPI-1 through FPI-14, and S1201 through S1204.

TABLE 6-29 ECOLOGICAL CONTAMINANTS OF CONCERN^A SETTLING POND 2

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION®
Surface Soil ^C		
PB	3:3	250
SN	3:3	53
NIT	3:3	43
NH3	3 :3	840
SO4	1:3	64
24DNT	1:4	7.6
26DNT	1:4	135
DEP	1:4	0.74
DNBP	1:3	1.5
DPA	1:3	1.5
NC	2:3	280

Notes

- * Constituents selected based on criteria presented in Table Q-8 and discussed in Section 5.0.
- 95th percentile or maximum; units in μ g/g.
- Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples FPII-1 through FPII-3 and S1205.

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TABLE 6-30 ECOLOGICAL CONTAMINANTS OF CONCERN^A SETTLING POND 3

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION
Surface Soil ^C		
PB	15:15	34
SN	15:15	72
NIT	15:15	4.9
NH3	15:15	520
SO4	2:15	36
24DNT	1:16	2.6
26DNT	1:15	1.5
DEP	1:16	44
DNBP	5:16	17.4
DPA	4:15	2.8
NC	2:15	190

^A Constituents selected based on criteria presented in Table Q-9 and discussed in Section 5.0.

 $^{^{9}}$ 95th percentile or maximum; units in μ g/g.

Assessment of surface soil contamination (0 to 2 feet) was performed using data from samples FPIII-1 through FPIII-15 and S1206.

TABLE 6-31 ECOLOGICAL CONTAMINANTS OF CONCERN^A SETTLING POND 4

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION
Surface Soil ^C		
AL	11:11	60,000
PB	11:11	300
SN	11:11	77
NIT	10:11	10
NH3	10:10	960
SO4	3:11	400
DPA	1:10	0.36
NC	2:11	1,038

Notes:

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^A Constituents selected based on criteria presented in Table Q-10 and discussed in Section 5.0.

⁸ 95th percentile or maximum; units in $\mu g/g$.

⁶ Assessment of surface soil contamination (0 to 2 feet) was performed using samples FPIV-1 through FPIV-10 and S1207.

TABLE 6-32 ECOLOGICAL CONTAMINANTS OF CONCERN^A SPOILS DISPOSAL AREA 1

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION®
Surface Soli ^c		
PB	5:5	249
SN	5:5	3.68
ZN	5:5	212
BR	2:2	12
CL	5:5	19
NIT	5:5	16
SO4	5:5	146
CH2CL2	3:3	0.01
24DNT	3:3	12
26DNT	1:1	1
B2EHP	1:1	0.35
DNBP	5:5	51
DNOP	1:1	8.6
DPA	4:4	24
NC	5:5	11,000
NG	1:1	19

^A Constituents selected based on criteria presented in Table Q-11 and discussed in Section 5.0.

⁹⁵th percentile or maximum; units in pg/g.

Assessment of surface soil contamination (0 to 2 feet) was performed using samples SD1-1 through SD1-5.

TABLE 6-33 ECOLOGICAL CONTAMINANTS OF CONCERN^A SPOILS DISPOSAL AREA 2

BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION®
Surface Soil ^C		
PB	5:5	373
SN	5:5	4.04
ZN	5:5	748
BR	1:1	4
CL	5:5	23
NIT	5:5	10
SO4	5:5	130
CH2CL2	3:3	.012
24DNT	4:4	1.3
DNBP	5:5	5.8
DPA .	5:5	3.2
NC	5:5	8.000

^A Constituents selected based on criteria presented in Table Q-12 and discussed in Section 5.0.

 $^{^{8}}$ 95th percentile or maximum; units in $\mu g/g$.

^c Assessment of surface soil contamination (0 to 2 feet) was performed using samples SD2-1 through SD2-5.

TABLE 6-34 ECOLOGICAL CONTAMINANTS OF CONCERN^A SPOILS DISPOSAL AREA 3

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION
Surface Soil ^c		
PB	10:10	67
SN	10:10	5.8
ZN	10:10	251
CL	10:10	17
NIT	10:10	22
SO4	10:10	75
CH2CL2	1:1	0.025
24DNT	5:5	1.1
DNBP	9:9	4
DPA	5:5	2.2
NC	10:10	3,800

^A Constituents selected based on criteria presented in Table Q-13 and discussed in Section 5.0.

⁸ 95th percentile or maximum; units in μ g/g.

c Assessment of surface soil contamination (0 to 2 feet) was performed using samples from SD3-1 through SD3-10.

TABLE 6-35 ECOLOGICAL CONTAMINANTS OF CONCERN^A SPOILS DISPOSAL AREA 4

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION®
Surface Soil ^C		
PB	10:10	120
SN	10:10	1.64
ZN	10:10	204
CL	9:9	13
NIT	10:10	12
SO4	10:10	139
CH2CL2	4:4	0.01
24DNT	1:1	0.7
B2EHP	1:1	0.32
DNBP	4:4	4.4
DNOP	3:3	0.63
DPA	1:1	1.1
NC	9:9	3,000

^A Constituents selected based on criteria presented in Table Q-14 and discussed in Section 5.0.

^{• 95}th percentile or maximum; units in μ g/g.

Assessment of surface soil contamination (0 to 2 feet) was performed using samples from SD4-1 through SD4-10.

TABLE 6-36 ECOLOGICAL CONTAMINANTS OF CONCERN^A SPOILS DISPOSAL AREA 5

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION
Surface Soil ^C		
PB	8:8	102
SN	10:10	1.94
ZN	9:9	306
BR	1:1	16
CL	9:9	18
NIT	10:10	18
SO4	10:10	38
CH2CL2	3:3	0.01
DNBP	7:7	6.5
DNOP	1:1	0.2
DPA	3:3	2.4
NC	8:8	11,000

^A Constituents selected based on criteria presented in Table Q-15 and discussed in Section 5.0.

 $^{^{\}rm B}$ 95th percentile or maximum; units in $\mu {\rm g}/{\rm g}$.

Assessment of surface soil contamination (0 to 2 feet) was performed using samples from SD5-1 through SD5-10.

TABLE 6-37 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL RECEPTORS PROPELLANT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

RECEPTOR	HAZARD INDICES ^A	
	ACUTE RISK [®]	CHRONIC RISK ^C
Short-tailed shrew	5.5E+03	1.1E+05
Eastern meadowlark	2.8E+02	2.0E+03
Garter snake	3.8E+02	6.3E+03
Red fox	2.2E+01	3.7E+01
Red-tailed hawk	2.5E+02	2.4E+02

- A Sum of the individual Hazard Quotients for each surface soil contaminant of concern; each HQ calculated by dividing the estimated exposure dosage by the Reference Toxicity Value (RTV). Hazard Quotients are presented in Appendix R, Tables R-31 and R-32 for acute and chronic exposures, respectively.
- Based on comparison to acute RTVs.
- ^c Based on comparison to chronic RTVs.

TABLE 6-38 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL RECEPTORS SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	HAZARD INDICES ^A	
RECEPTOR	ACUTE RISK ^B	CHRONIC RISK
Final Creek Area		
Short-tailed shrew	8.0E+01	2.6E+03
Eastern meadowlark	2.0E+00	2.8E+00
Garter snake	3.9E+00	5.1E+01
Red fox	5.1E-1	2.2E-1
Red-tailed hawk	5.5E-01	2.4 E-0 2
Settling Pond 1 Area		
Short-tailed shrew	3.5E+02	7.8E+03
Eastern meadowlark	8.3E+00	2.4E+01
Garter snake	1.7E+01	3.9E+02
Red fox	2.3E+00	3.8E+00
Red-tailed hawk	2.0E+00	7.5E-01
Settling Pond 2 Area		
Short-tailed shrew	4.7E+02	1.0E+04
Eastern meadowlark	1.1E+01	3.2E+01
Garter snake	2.4E+01	5.1E+-01
Red fox	6.6E-01	8.5E-01
Red-tailed hawk	1.9E+00	2.6E-01
Settling Pond 3 Area		
Short-tailed shrew	6.8E+01	2.5E+03
Eastern meadowlark	1.7E+00	6.4E+00
Sarter snake	3.4E+00	1.3E+02
Red fox	2.0E-01	3.5E+00
Red-tailed hawk	5.5E-01	2.7E-01
Settling Pond 4 Area		• .
Short-tailed shrew	6.7E+02	1.4E+04
Eastern meadowlark	2.0E+01	1.0E+02
Garter snake	3.3E+01	6.8E+02
Red fox	3.5E+00	5.6E+00
Red-tailed hawk	1.1E+01	4.6E+00
Spoils Disposal Site 1 Area		
Short-tailed shrew	6.6E+02	1.3E+04
Eastern meadowlark	1.5E+01	4.3E+01
Garter snake	3.3E+-1	6.63+02
Red fox	1.7E+00	2.5E-01
Red-tailed hawk	5.5E+00	3.3E-01
Spoils Disposal 2 Area	0.02 - 00	0.02-01
Short-tailed shrew	7.2E+02	1.4E+04
Eastern meadowlark	1.7E+01	3.4E+01
Garter snake	3.6E+01	4.9E+02
morror GIRANG	J.UL. T (J I	4.96+02

TABLE 6-38 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL RECEPTORS SETTLING PONDS AND SPOILS DISPOSAL AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

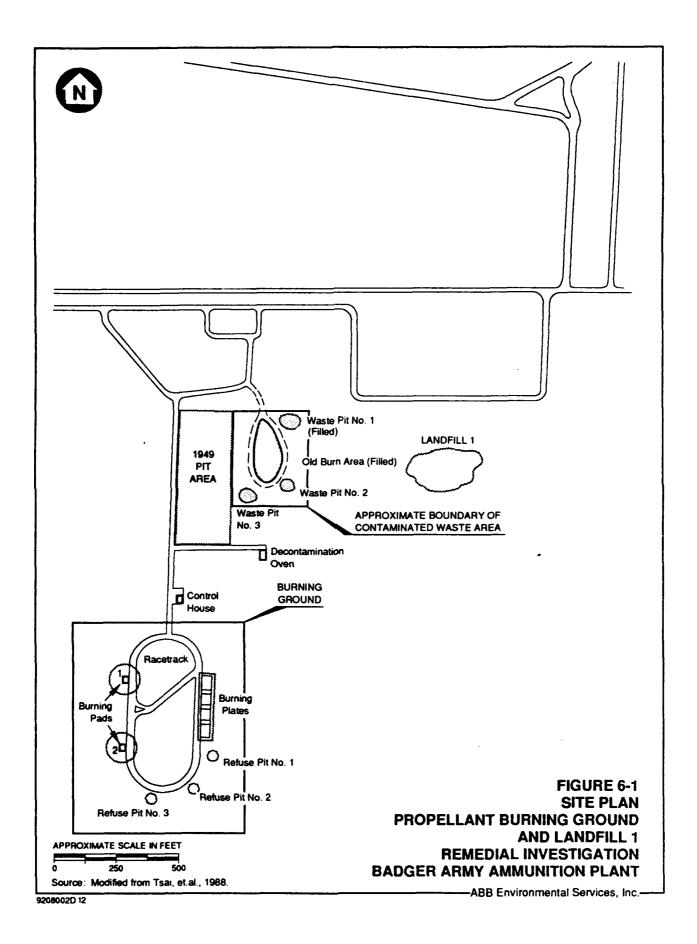
	HAZARD INDICES ^A	
RECEPTOR	ACUTE RISK ⁸	CHRONIC RISK ^C
Red fox	3.1E+00	2.3E-01
Red-tailed hawk	1.1E+01	3.5E-01
Spoils Disposal 3 Area		
Short-tailed shrew	1.3E+2	2.6E+03
Eastern meadowlark	3.3E+00	5.7E+00
Garter snake	6.7E+00	7.9E + 01
Red fox	8.7E-01	7.2E-02
Red-tailed hawk	3.2E+00	7.7E-02
Spoils Disposal 4 Area		
Short-tailed shrew	2.3E+02	4.6E+03
Eastern meadowlark	5.5E+00	1.5E+01
Garter snake	1.2E+01	2.3E+02
Red fox	1.1E+00	1.2E-01
Red-tailed hawk	3.8E+00	1.7E-01
Spoils Disposal 5 Area		
Short-tailed shrew	2.0E+02	3.9E+03
Eastern meadowlark	4.9E+00	1.4E+01
Garter snake	1.0E+01	1.9E+02
Red fox	1.4E+00	1.4E-01
Red-tailed hawk	5.2E+00	2.1E-01

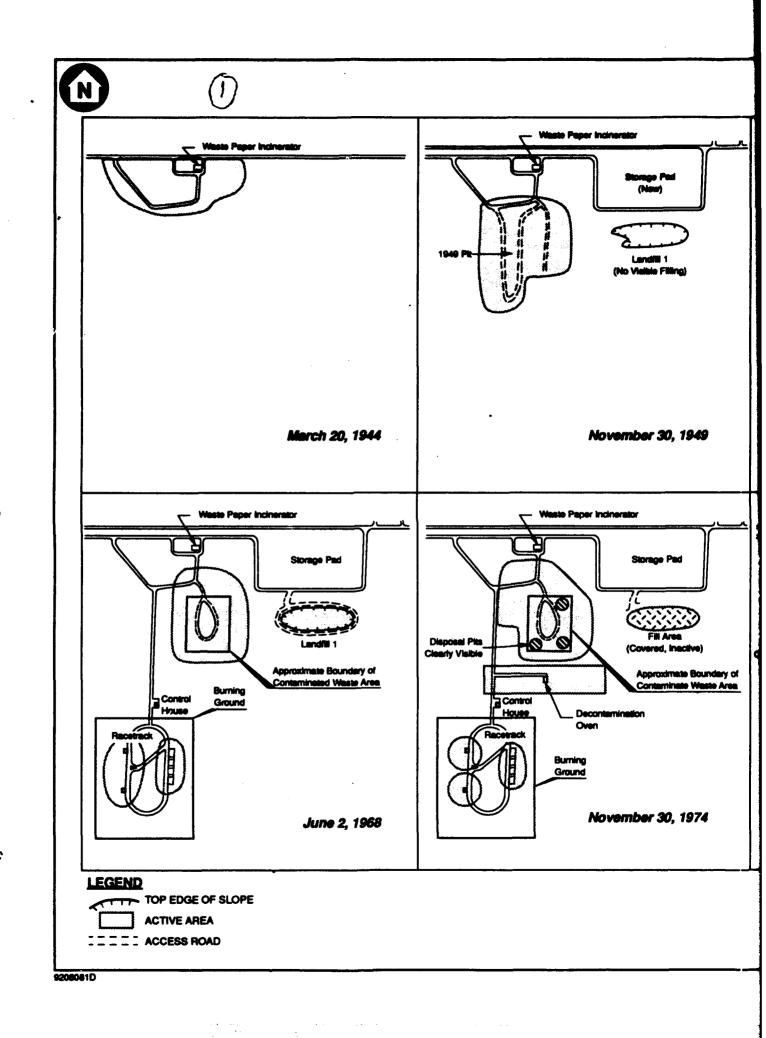
A Sum of the individual Hazard Quotients for each surface soil contaminant of concern; each HQ calculated by dividing the estimated exposure dosage by the Reference Toxicity Value (RTV). Hazard Quotients are presented in Appendix R, Tables R-33 through R-52.

Based on comaprison to acute RTVs.

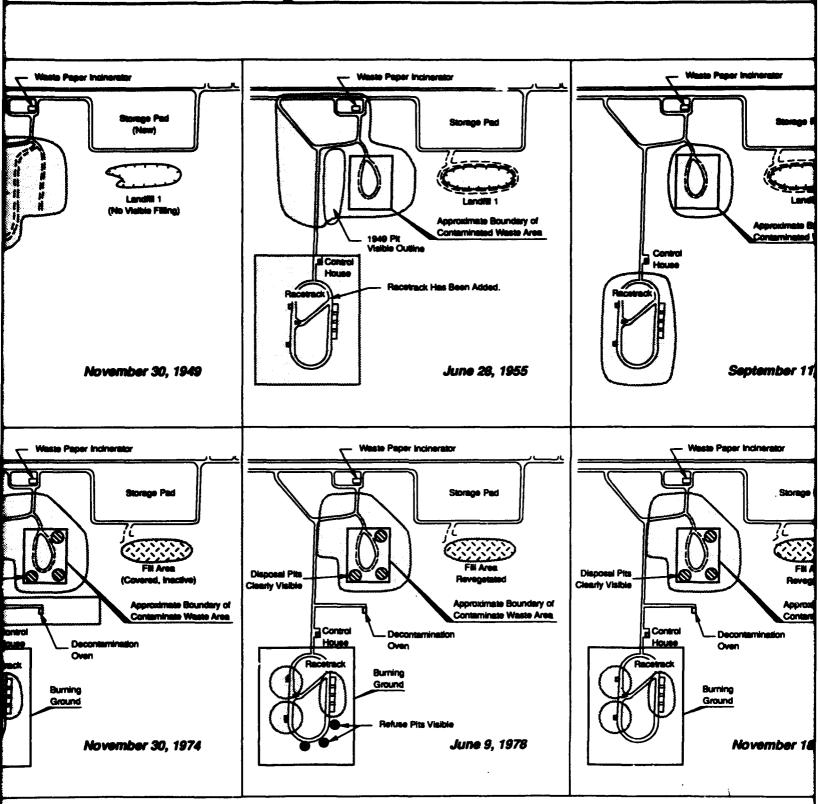
^c Based on comparison to chronic RTVs.

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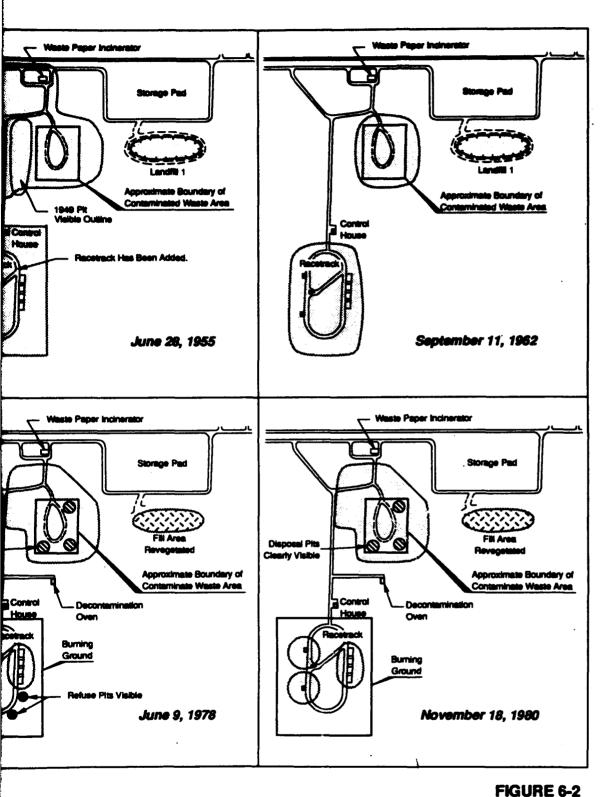




CHRONOLOGICAL EVOLUTION OF THE PROPELLANT BURNING REMEDIAL INVE BADGER ARMY AMMUNITI

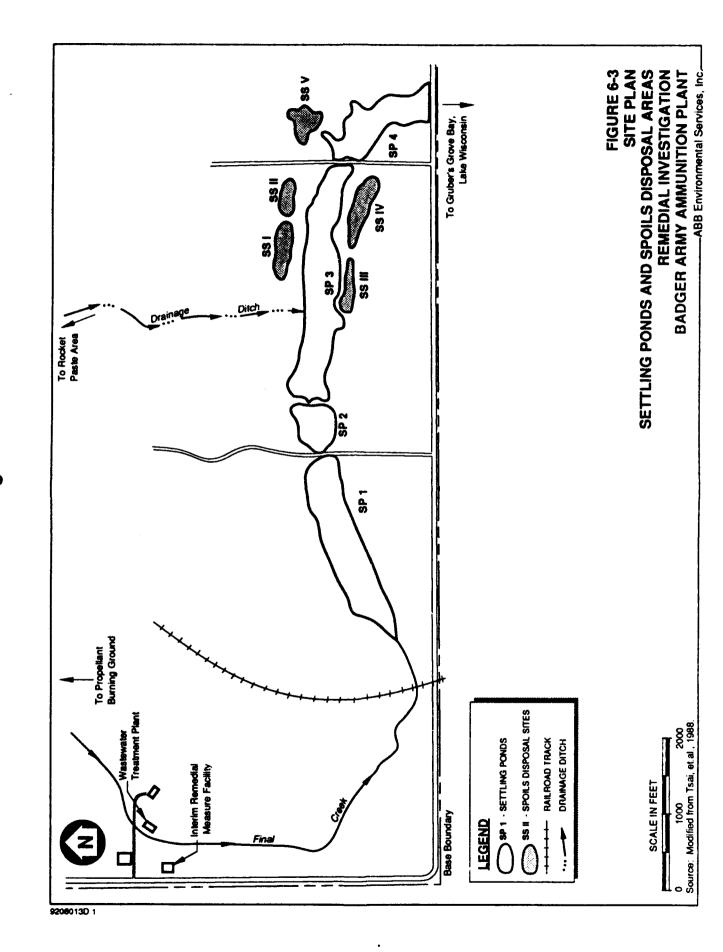
-ABB Environmental

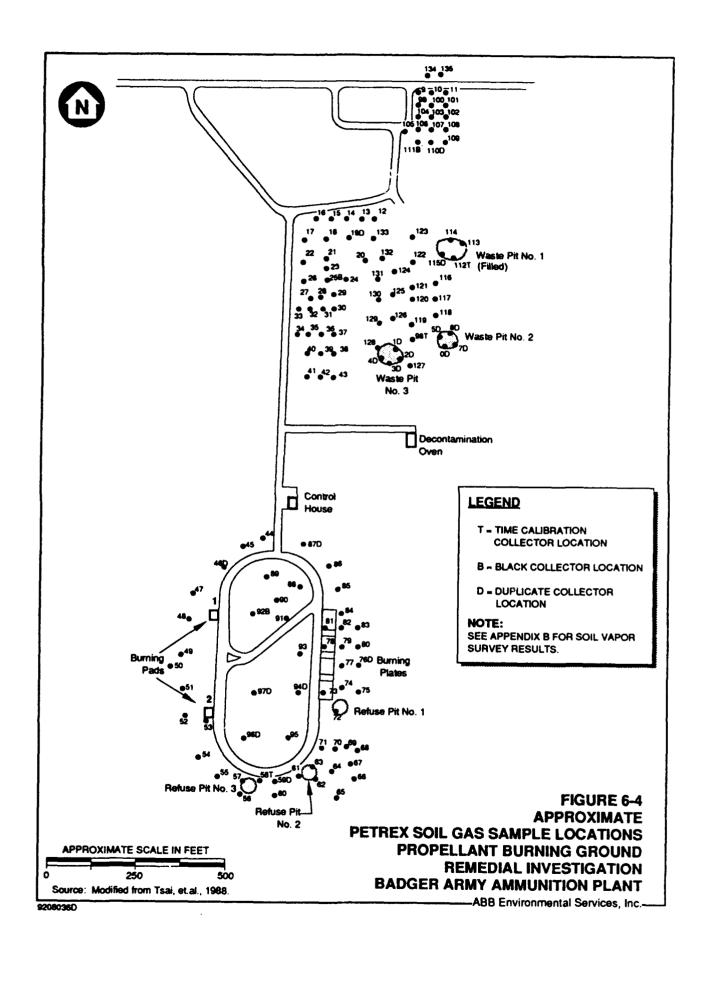
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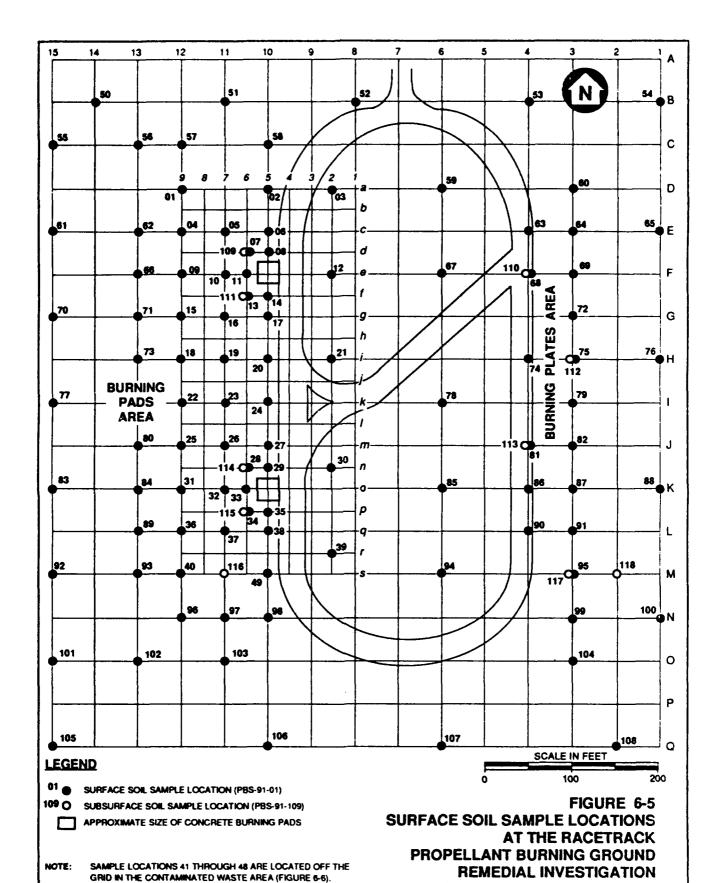


CHRONOLOGICAL EVOLUTION OF THE PROPELLANT BURNING GROUND REMEDIAL INVESTIGATON BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.







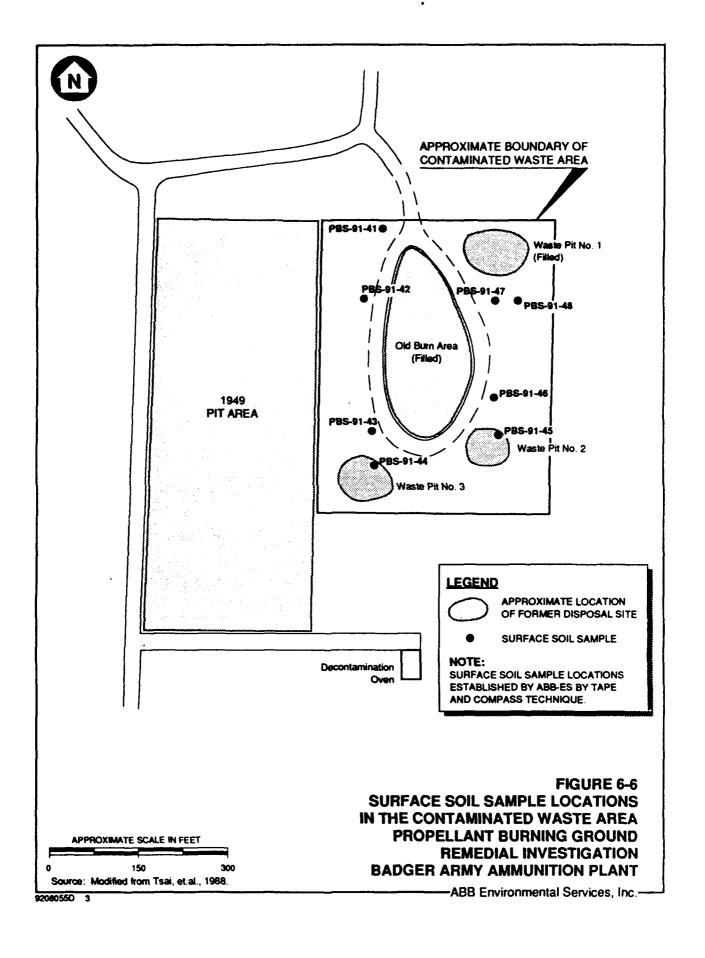
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BADGER ARMY AMMUNITION PLANT

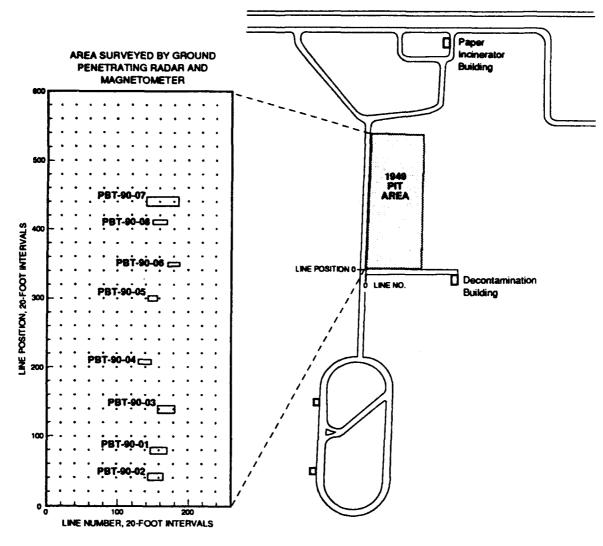
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SOURCE: MODIFIED FROM FIGURE 4-12 OF TSALET AL., 1968.







LEGEND

GRID POINTS

PET-90-01 TEST PIT LOCATION AND DESIGNATION

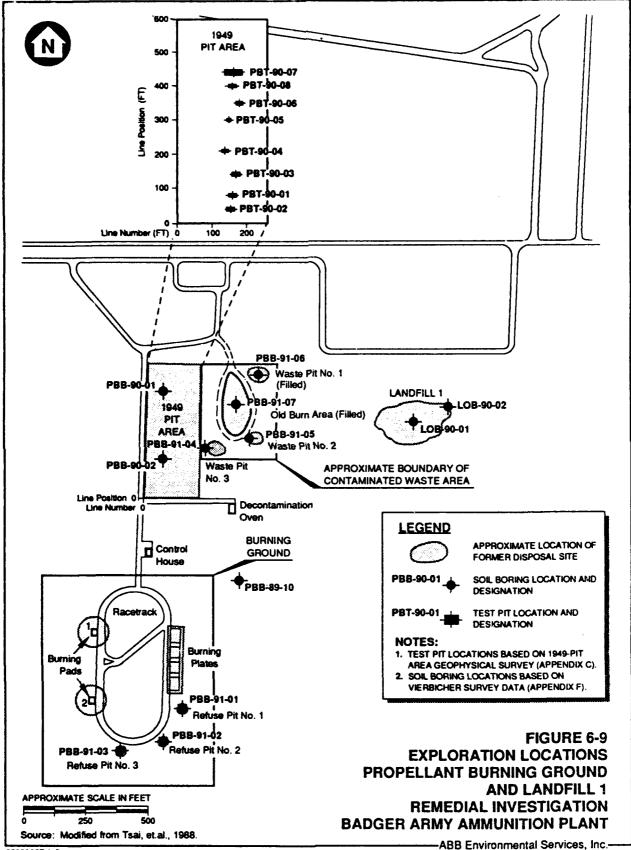
FIGURE 6-7
GEOPHYSICAL SURVEY AREA
1949 PIT AREA
PROPELLANT BURNING GROUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

APPROXIMATE SCALE IN FEET

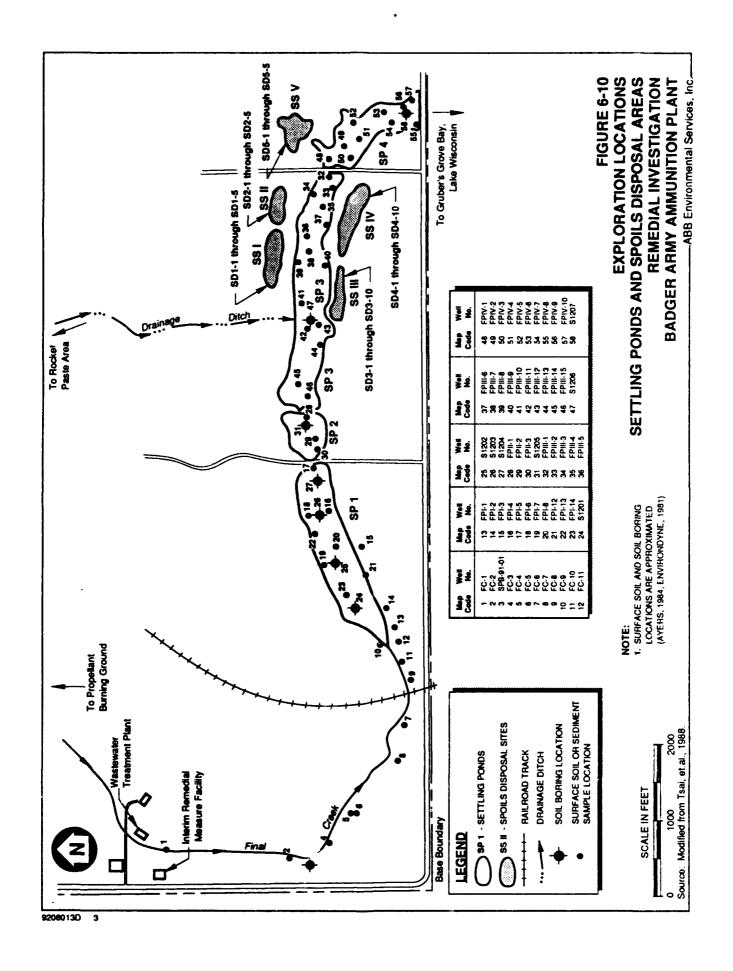
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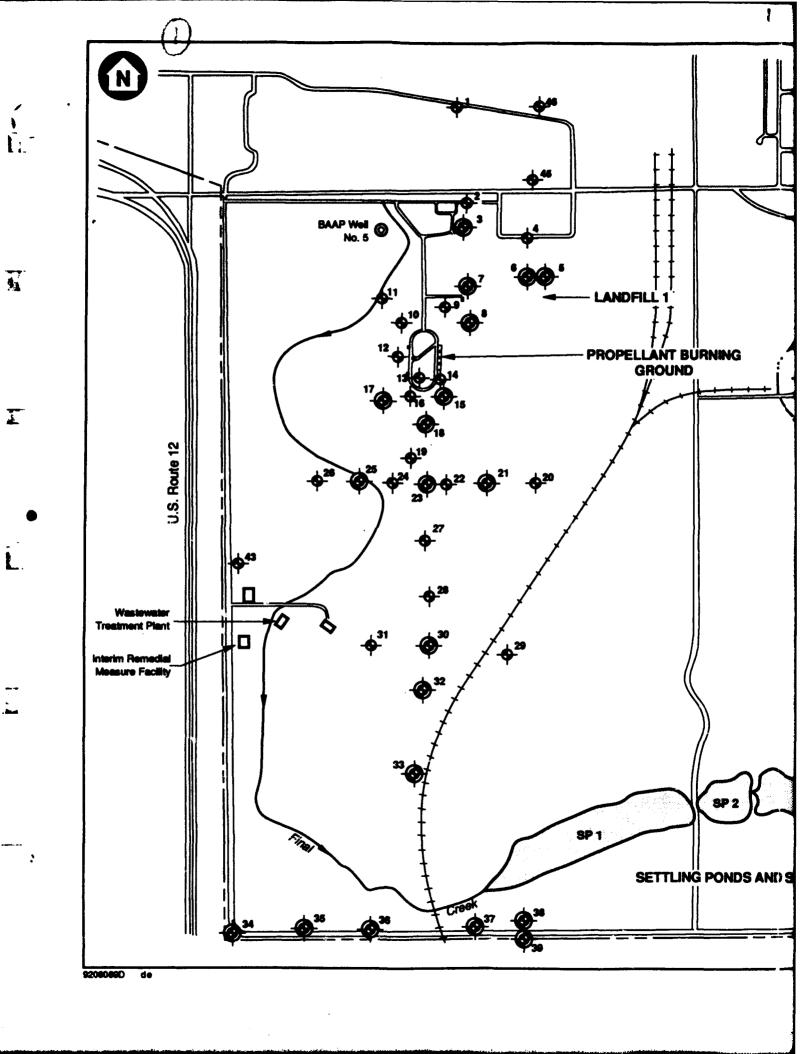
-ABB Environmental Services, Inc.

FIGURE 6-8 GEOPHYSICAL SURVEY AREA LANDFILL 1 BADGER ARMY AMMUNITION PLANT -ABB Environmental Services, Inc. Concrete/Asphalt Rubble **Cultivated Field** Dirt Road CONCRETE/ASPHALT RUBBLE • • • TC SURVEY GRID POINTS GPR TRAVERSE APPROXIMATE SCALE IN FEET LEGEND 9209023D

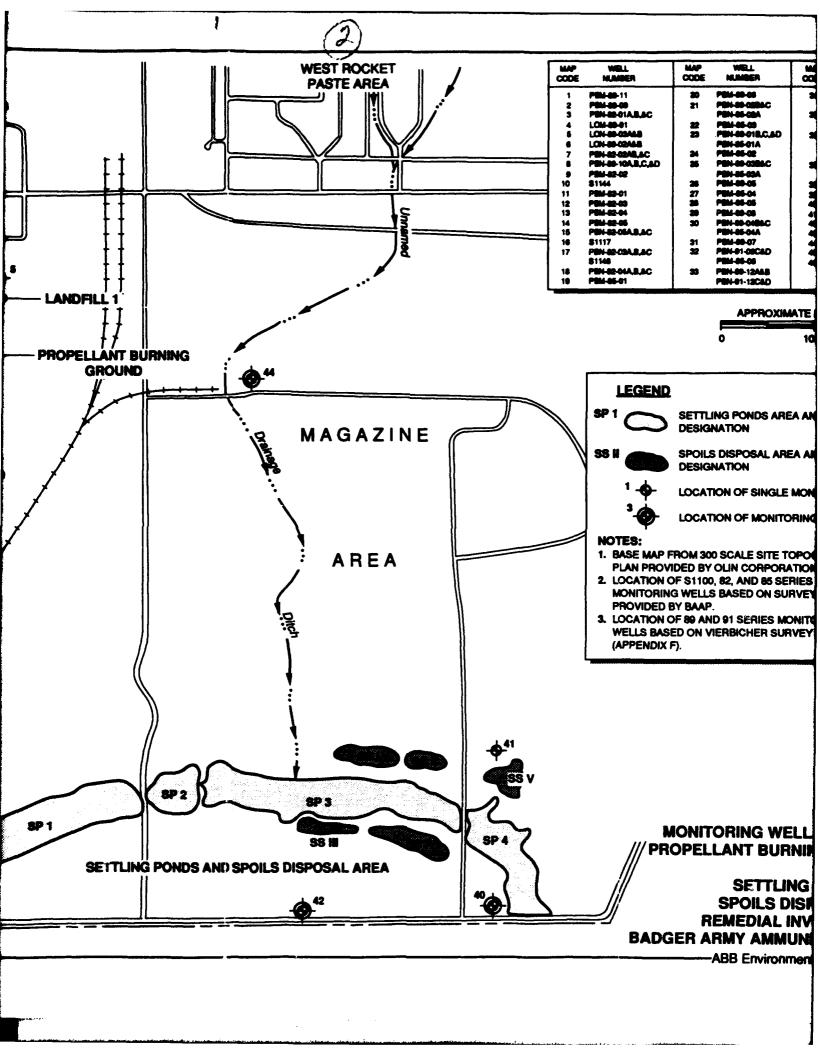


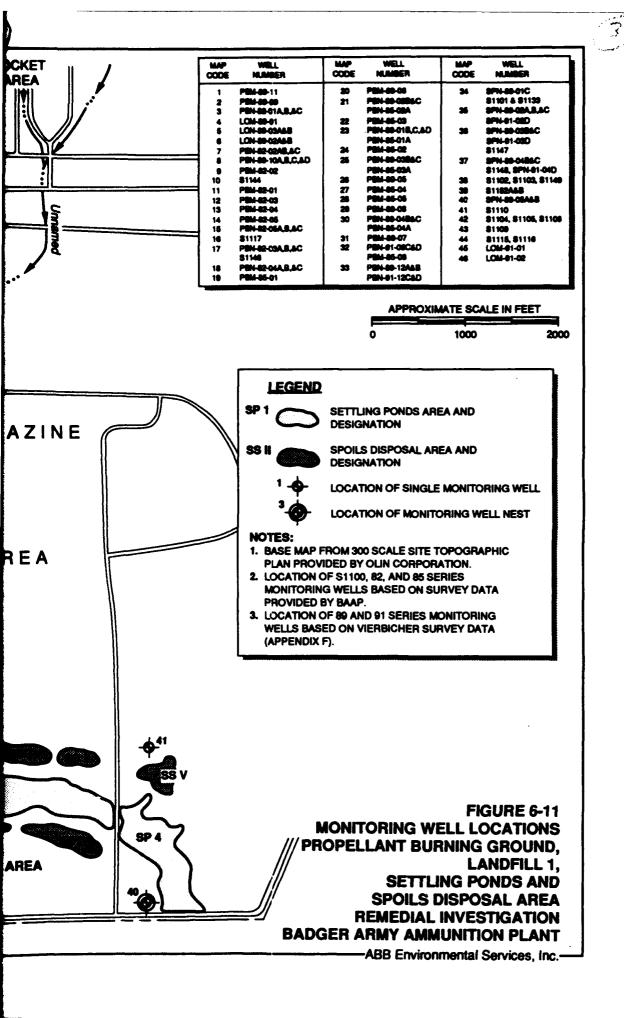
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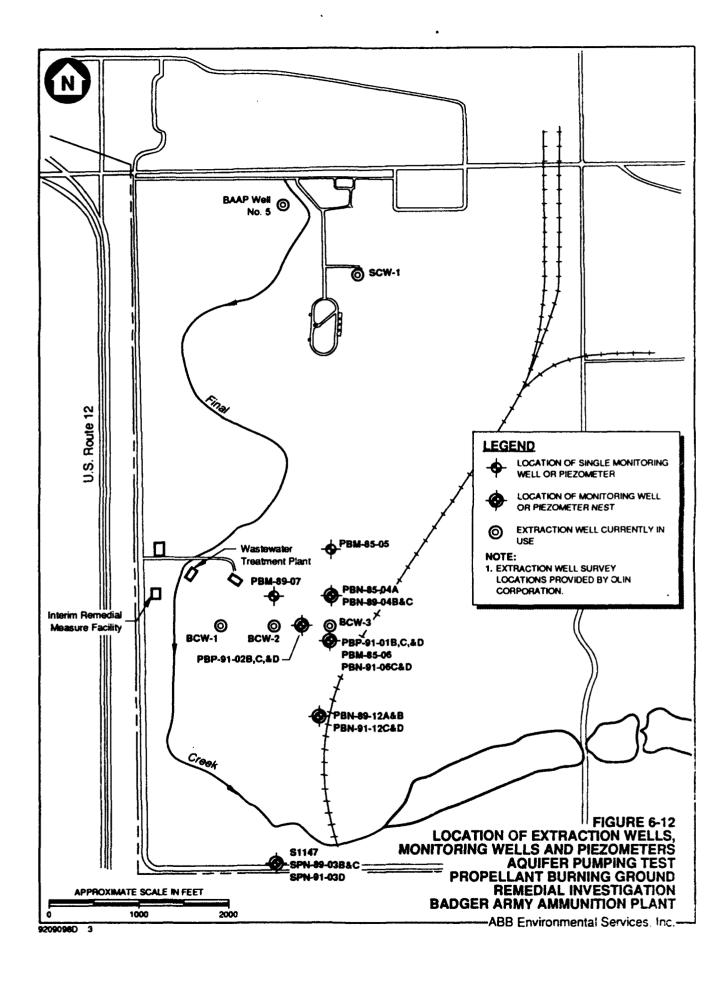


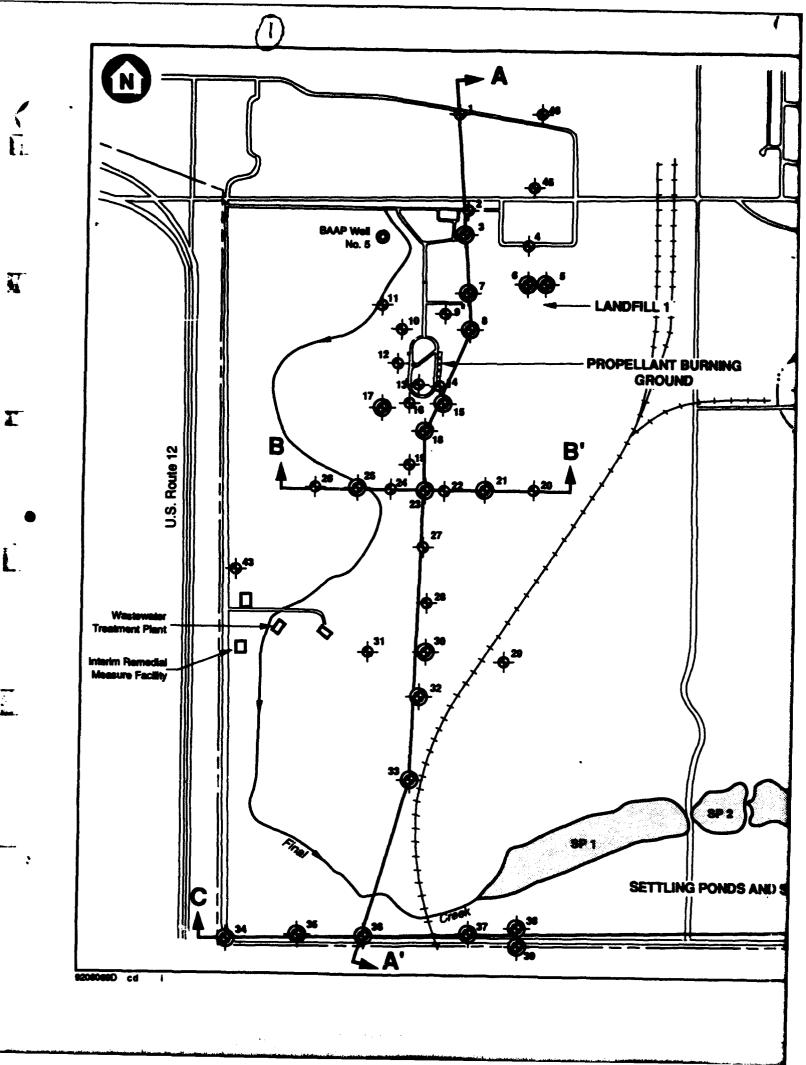


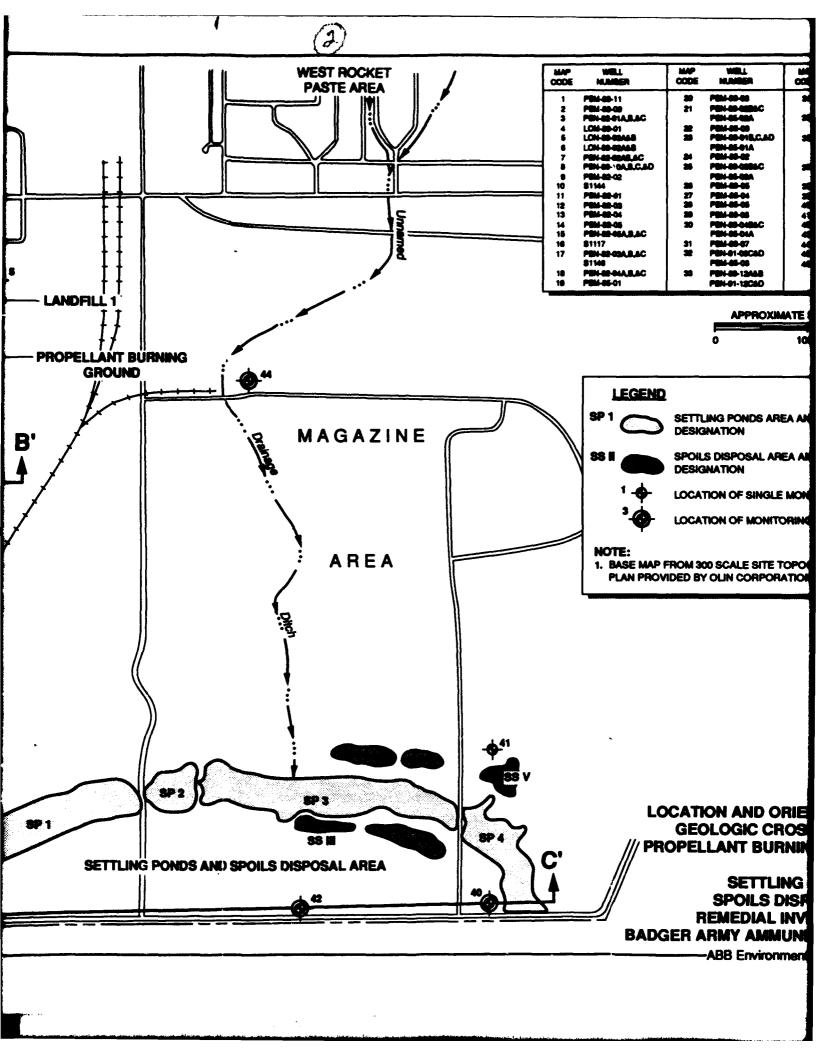
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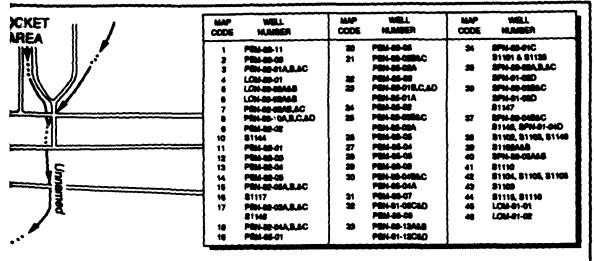






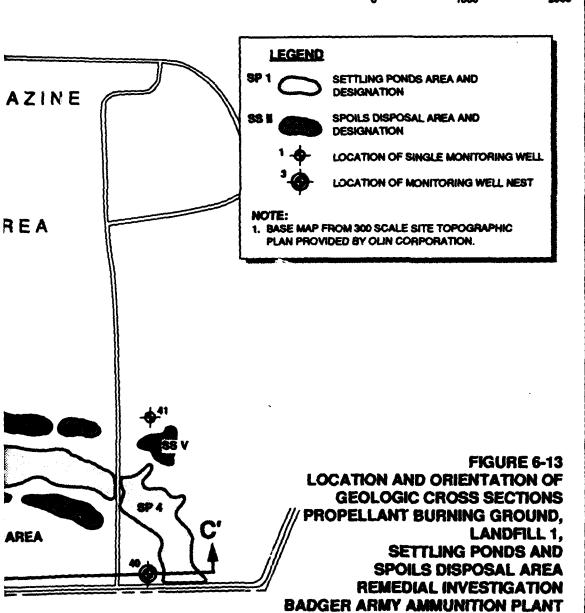


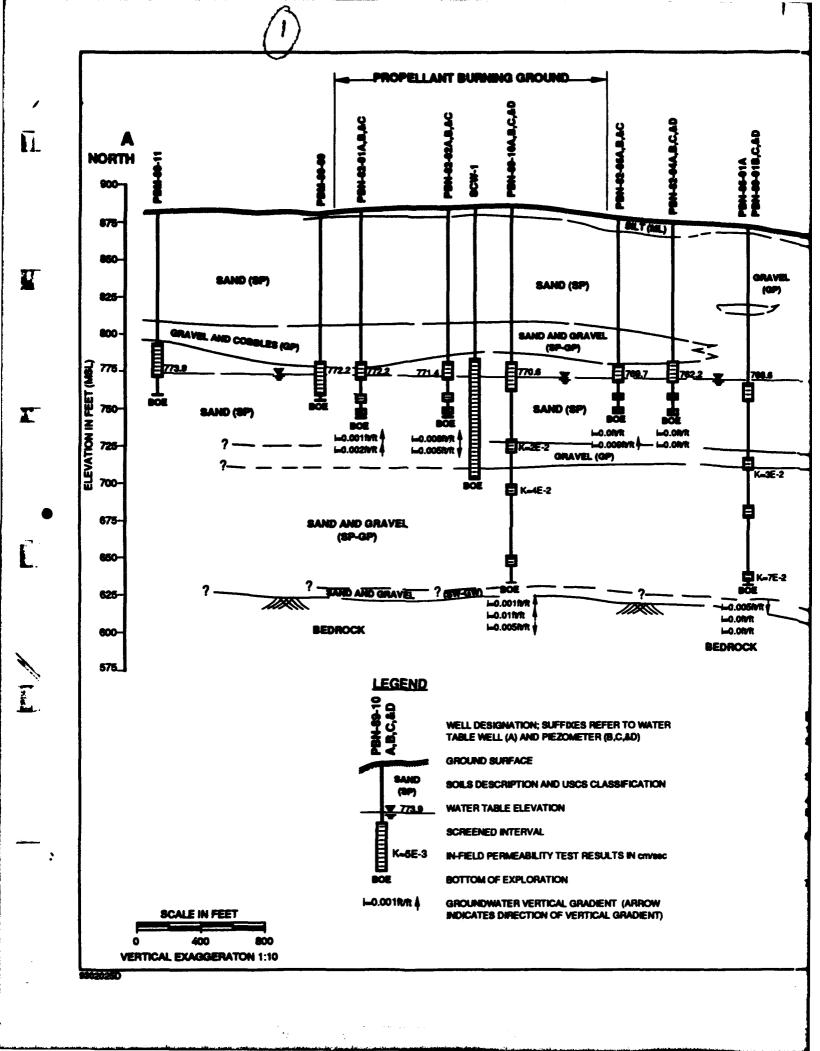


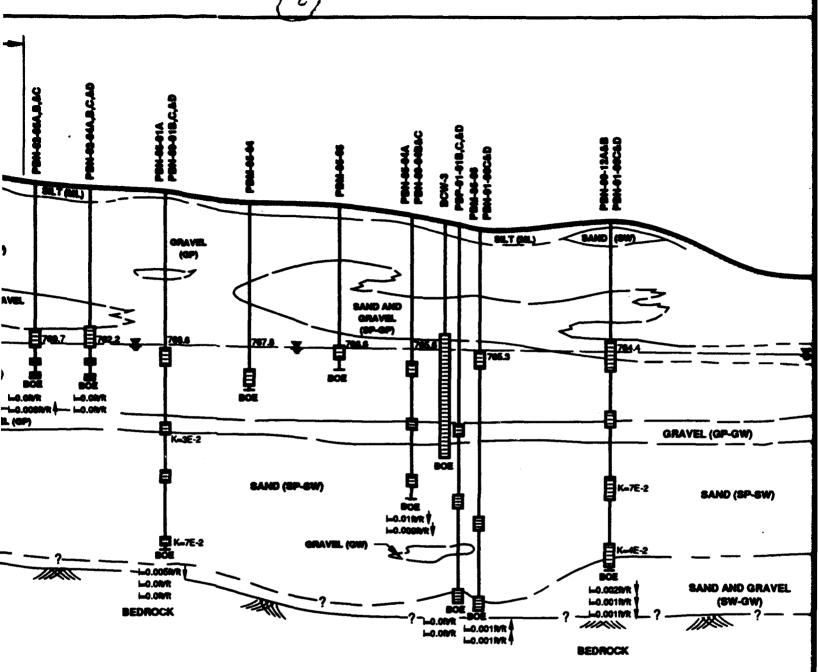


APPROXIMATE SCALE IN FEET

-ABB Environmental Services, Inc.







REFER TO WATER TER (B,C,AD)

CLASSIFICATION

RESULTS IN COVERC

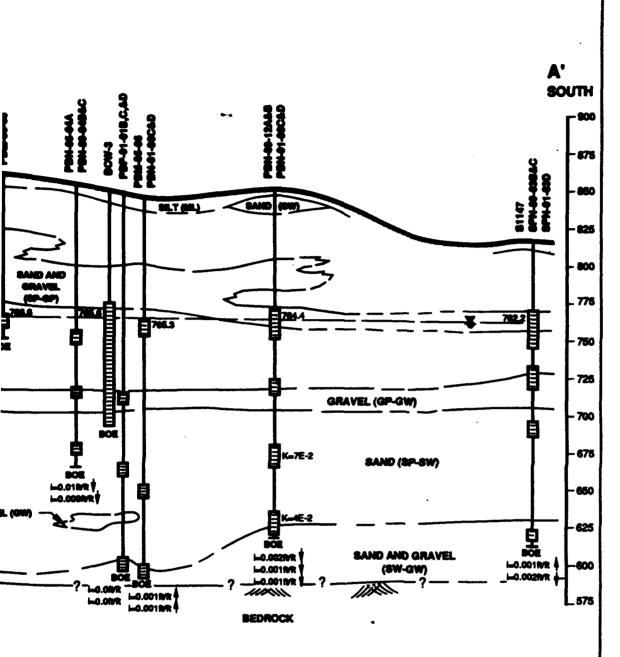
ADIENT (ARROW TICAL GRADIENT)

NOTES:

- 1. SEE FIGURE 2-2 FOR LOCATION AND ORIENTATION OF PROFILE.
- 2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE DATA. ACTUAL CONDITIONS SETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
- S. ON MAILTIPLE WELL NESTS, GRADIENTS ARE LISTED IN ORDER OF SHALLOW TO DEEP WELLS; Lo., A TO B, B TO C AND C TO D.
- 4. WATER LEVELS MEASURED IN WATER TABLE WELLS ON 12/15/81 ARE LISTED.
- 5. BEDROCK SURFACE ELEVATION ESTIMATED FROM PBB-89-10 AND PRODUCTION WELL NO. 5.
- 6. REDROCK SUFFACE ELEVATION ESTIMATED FROM PBN-69-12D (LOCATED ADJACENT TO PBN-69-10), SPN-61-04D (LOCATED APPROXIMATELY 1200 FEET EAST OF SPN-61-03D), AND PRODUCTION WELL NO. 5 (LOCATED APPROXIMATELY 1000 FEET NORTH OF PBN-69-10).
- 7. PBP-01-0-28,C,AD IS USED ONLY FOR GEOLOGIC INFORMATION AND AQUIFER ANALYSIS. IT IS NOT A MONITORING WELL CLUSTER.

GEOLOGIC CROSS S PROPELLANT BURNIN SETTLING (SPOILS DISI REMEDIAL INV BADGER ARMY AMMUN

ABB Environment



OCATION AND ORIENTATION OF PROFILE. ON AN INTERPRETATION OF AVAILABLE SUBBURFACE TIONS BETWEEN EXPLORATIONS MAY VARY FROM

STS, GRADIENTS ARE LISTED IN ORDER OF SHALLOW TO B, B TO C AND C TG 0.

IRED IN WATER TABLE WELLS ON 12/15/91 ARE LISTED.

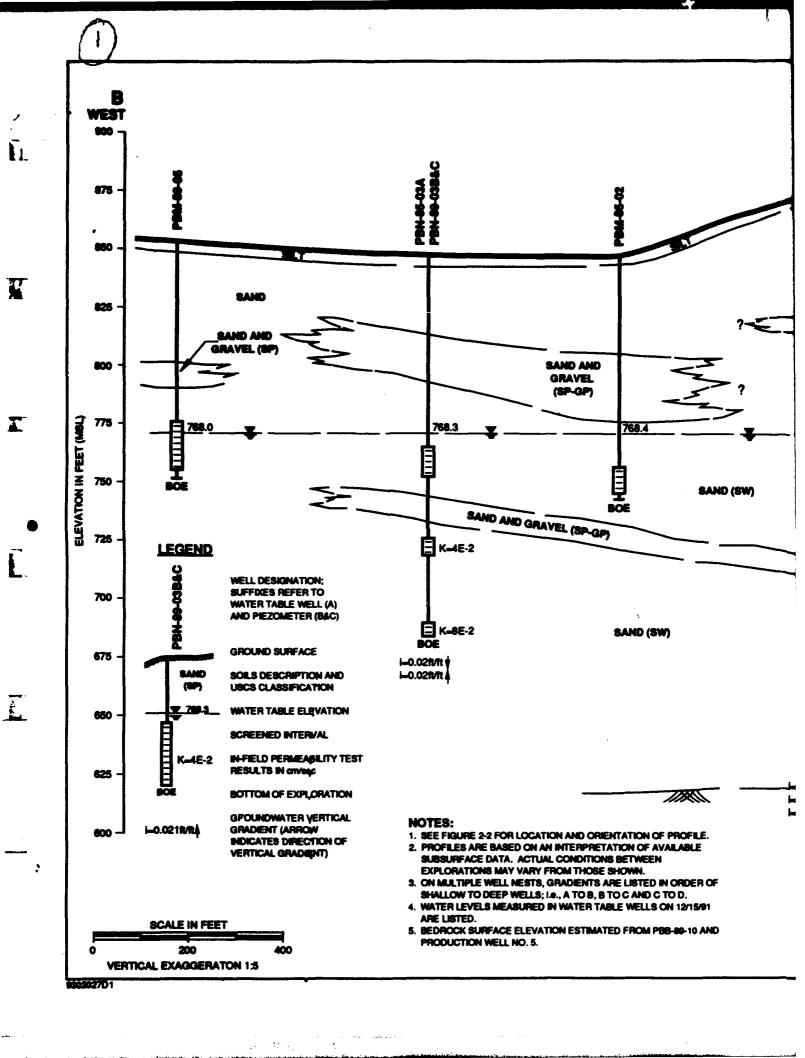
EVATION ESTIMATED FROM PBB-88-10 AND

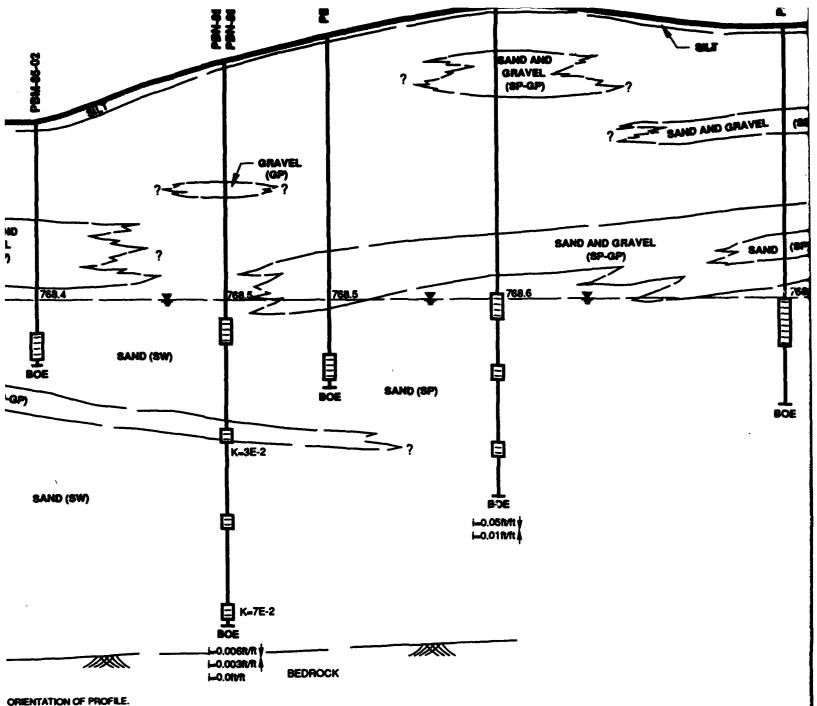
EVATION ESTIMATED FROM PEN-49-12D (LOCATED 10), SPN-01-04D (LOCATED APPROXIMATELY 1200 FEET 141D PRODUCTION WELL NO. 8 (LOCATED FEET NORTH OF PEN-49-10).

ED ONLY FOR GEOLOGIC INFORMATION AND AQUIFER MONITORING WELL CLUSTER.

FIGURE 6-14
GEOLOGIC CROSS SECTION A-A'
PROPELLANT BURNING GROUND,
SETTLING POINDS AND
SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.



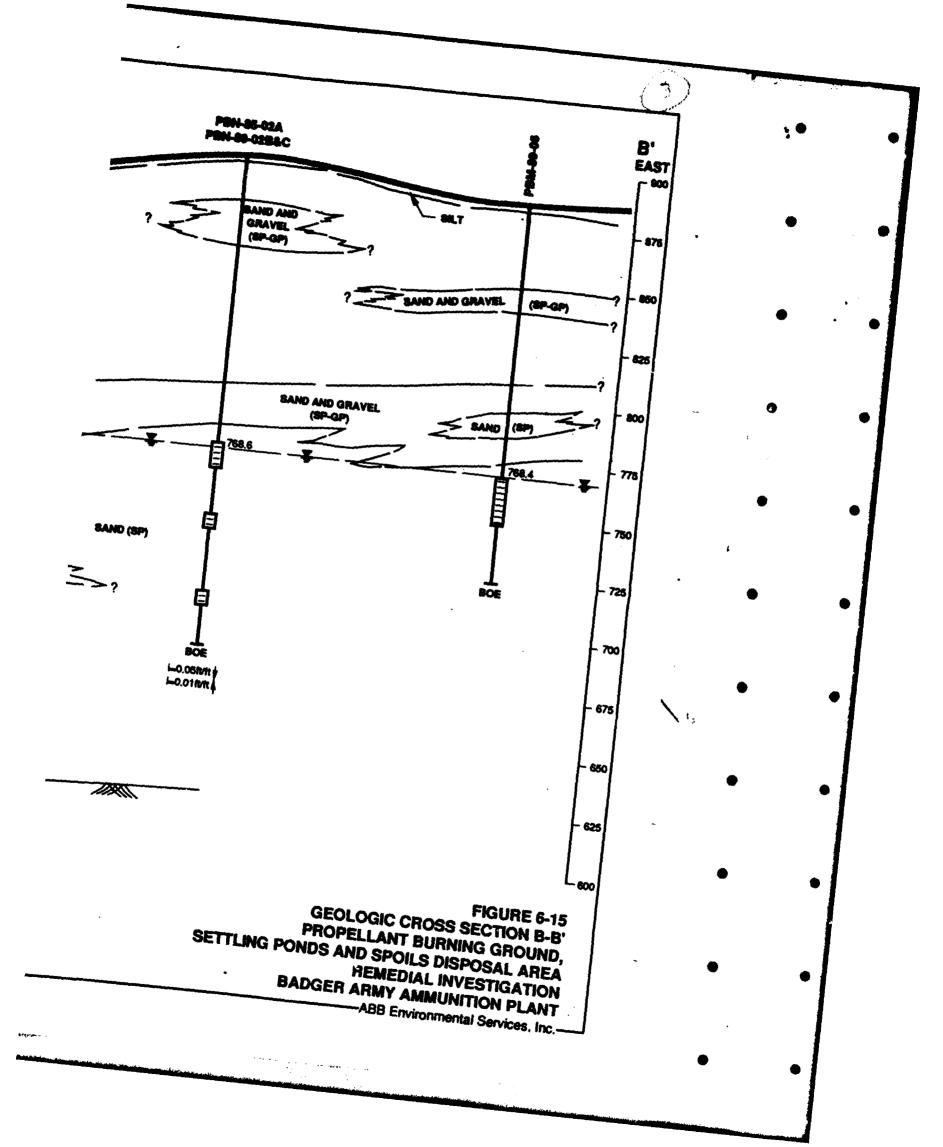


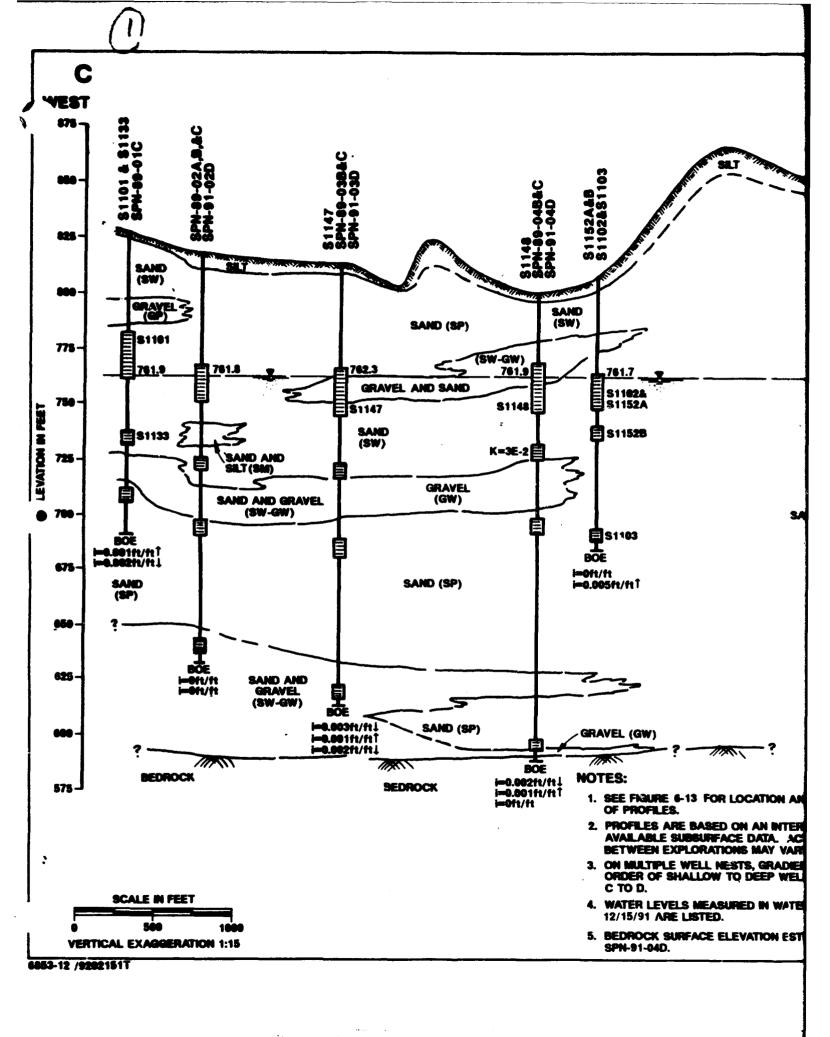
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B, B TO C AND C TO D.
R TABLE WELLS ON 12/15/91

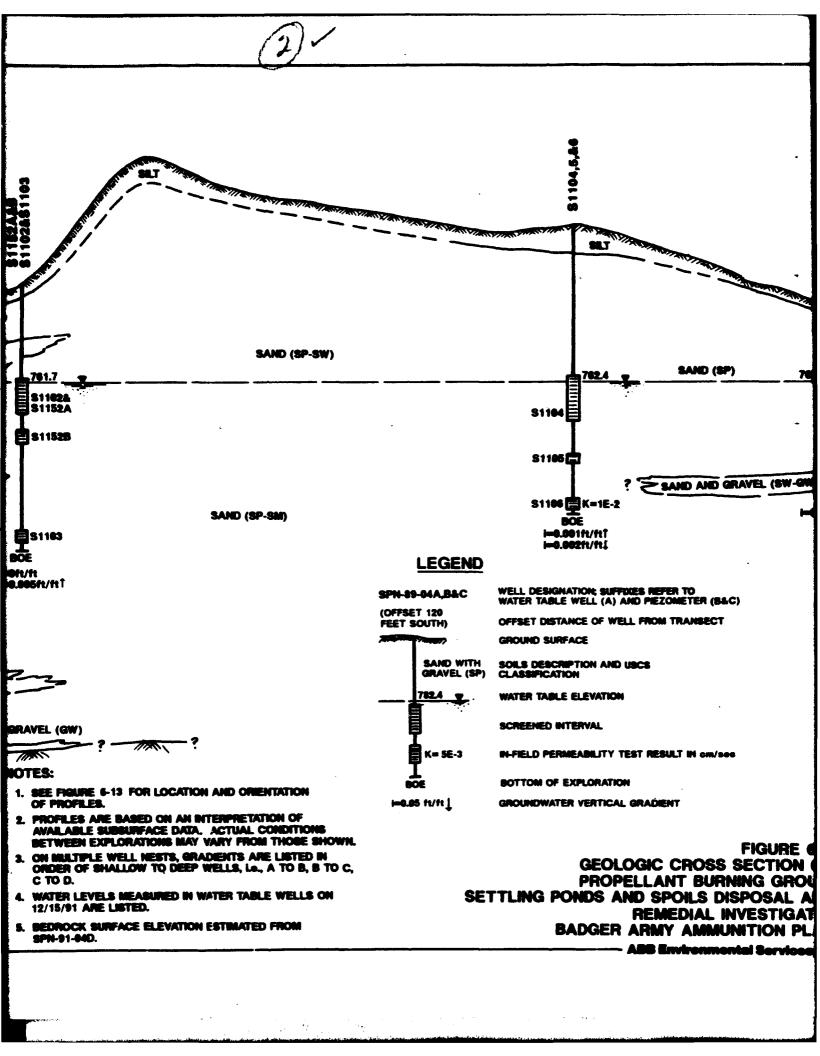
MATED FROM PBB-89-10 AND

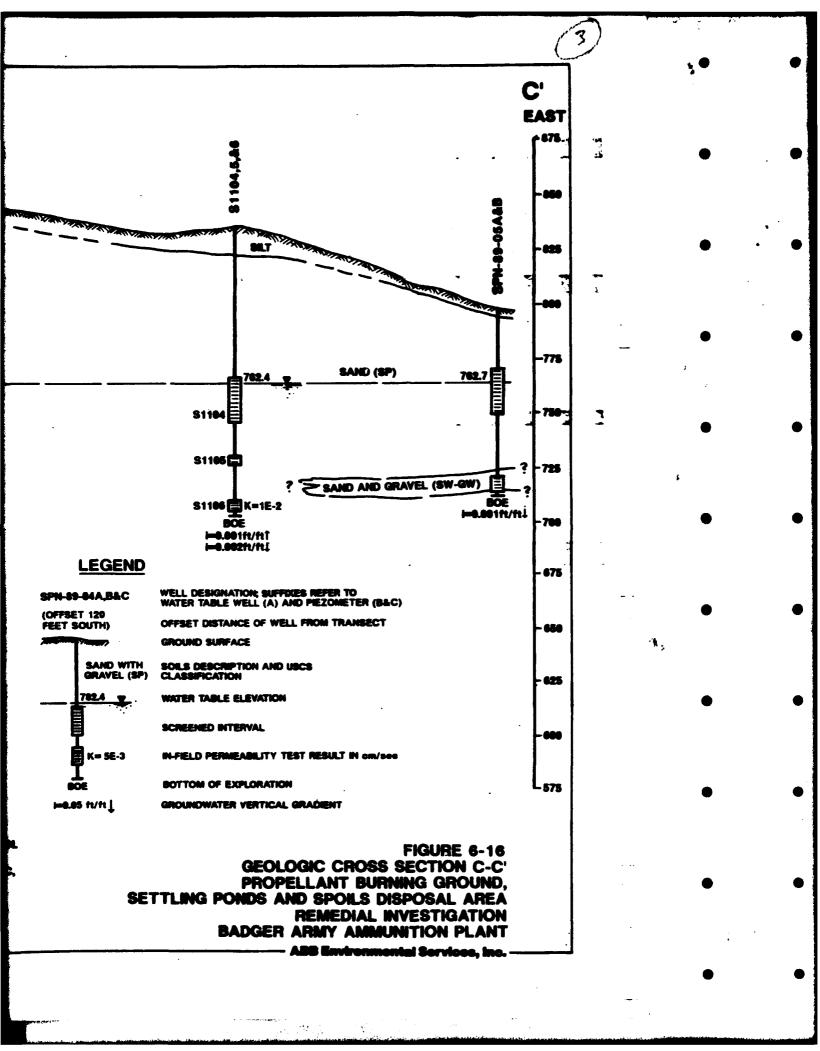
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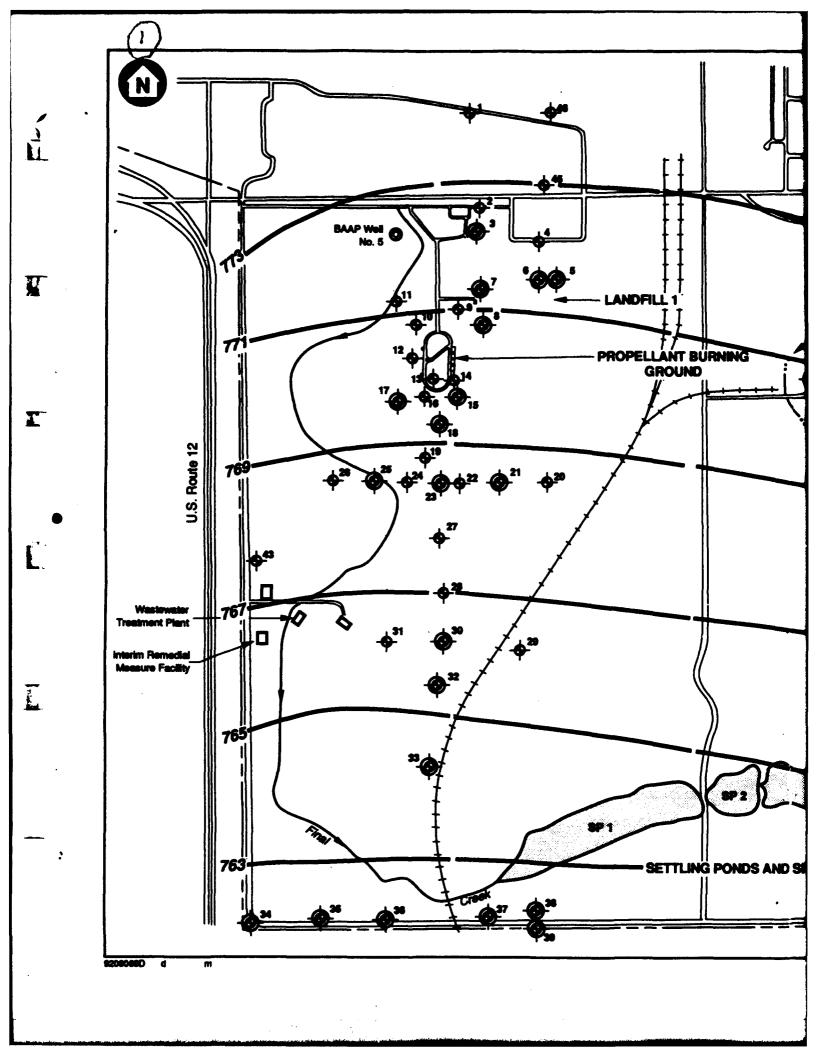
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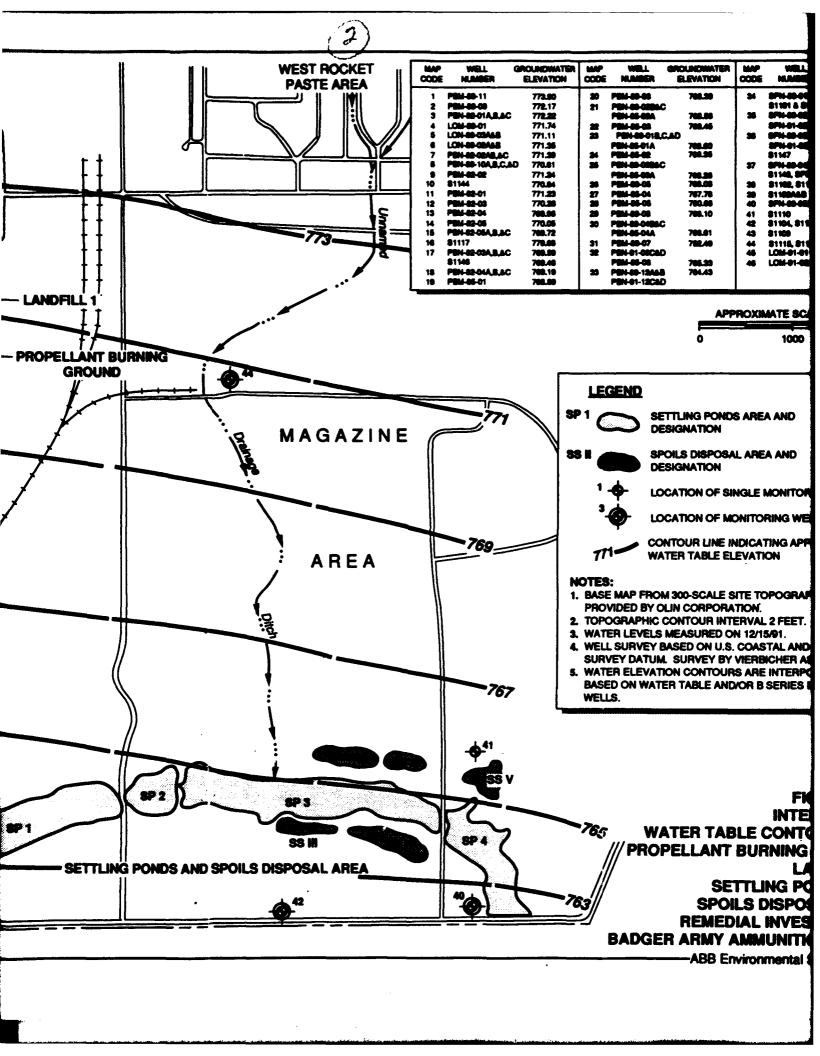






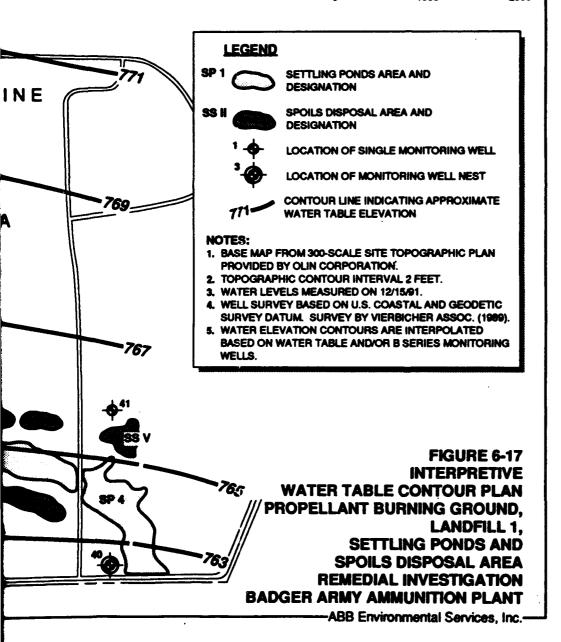




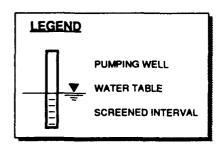


n [MAP COOE	WELL NUMBER	GROUNDWATER ELEVATION	CODE	WELL (ELEVATION	MAP	WELL MAMBER	GROUNDWATER ELEVATION
II ſ	1	P8M-80-11	773.90	20	PBM-69-05	700.20	*	8FN-89-01C	
# I	2	PBM-80-00	772.17	21	PEN-00-0000C			81101 & 81139	761.87
П	3	PEN-SE-01A,B,AC	772.22		PEN-85-CBA	706.00	35	SPN-SS-GEA.B.AC	761.62
'Л	4	LOM-89-01	771.74	22	PBM-85-05	708.46		371-01-02 0	
/	5	LON-se-coals	771.11	23	PBN-89-018,C,	AD CA	36	97%-00-0000C	
- 1	•	LON-80-GEALS	771.36		PBN-85-01A	700.60		SFN-81-00D	
_	7	PRIVATE CEASUAC	771.39	24	PBM-85-02	700.35		81147	702.08
_		PRIN-80-10AB,C,A		26	PEN-49-03BAC		37	SPN-89-0486C	761.87
	_	POM-ee-de	771.24		PBN-86-09A	700.20		\$1146, \$PN-01-04	-
	10	\$1144	770.84	28	PBM-89-05	700.03	38	\$1102, \$1100, \$11	
7	11	PBM-08-01	771.23	27	PBM-05-04	767.76	39	51182A&&	761.66
ı		PEM-82-03	770.28	2	PBM-85-05	700.00	40	SPN-80-05ALB	702.67
- 1	13	PBM-82-04	700.06	29	PBM-88-08	766.10	41	81110	700.00
_ i	14	PBM-82-05	770.06	30	PEN-89-04BSC		42	51104, 81106, 811	
=	15	PBN-82-05A,B,AC		I	PBN-85-04A	706.01	49	81100	706.74
┙	16	81117	770.00	31	PBM-89-07	782.40	44	\$1116, \$1116	770.81
_	17	PEN-SE-COA,B,AC		*	PBN-01-08CAD		46	LOM-01-01	772.82
- 1		S1146	700.46		PBM-85-06	706.33	46	LOM-01-02	773.00
- 1	18	PBN-88-01A,B,AC		20	PEN-00-12AAS	704.43			
- 1	19	PBM-86-01	700.00	1	PBN-81-12C&D]		





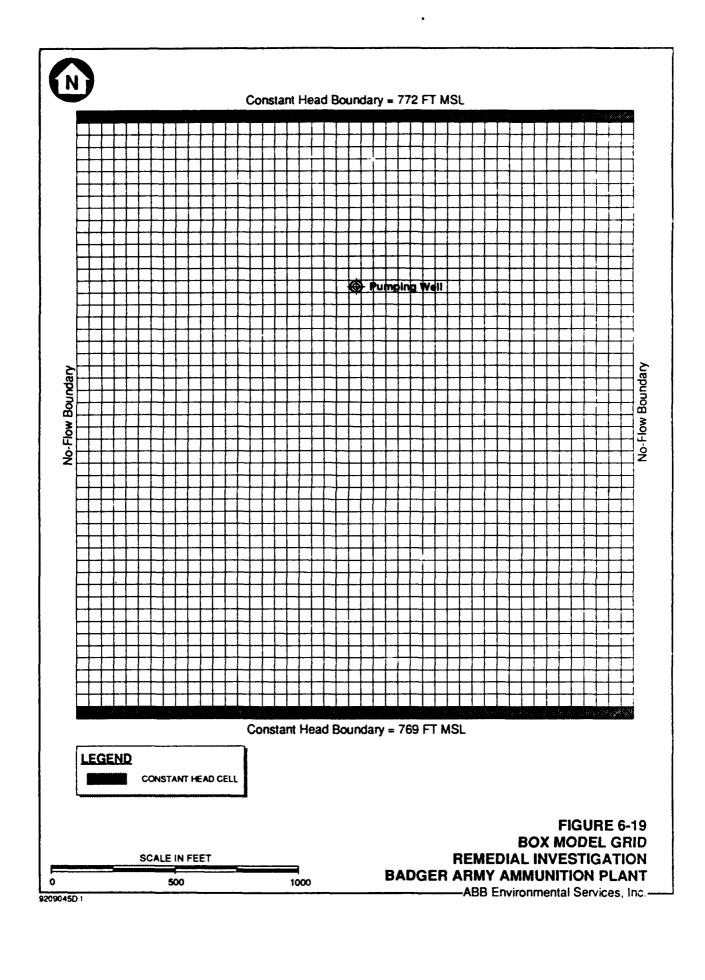
Unsaturated Zone (Sand)	▼	
1 Sand =	K = 150 ft/day	55
2 Gravel	K = 1500 ft/day	15
3 Sand	K = 150 ft/day	15
4 Sand	K = 150 ft/day	15
5 Sand	K = 150 ft/day	15
6 Sand	K = 150 ft/day	20
7 Gravel	K = 1500 ft/day	15

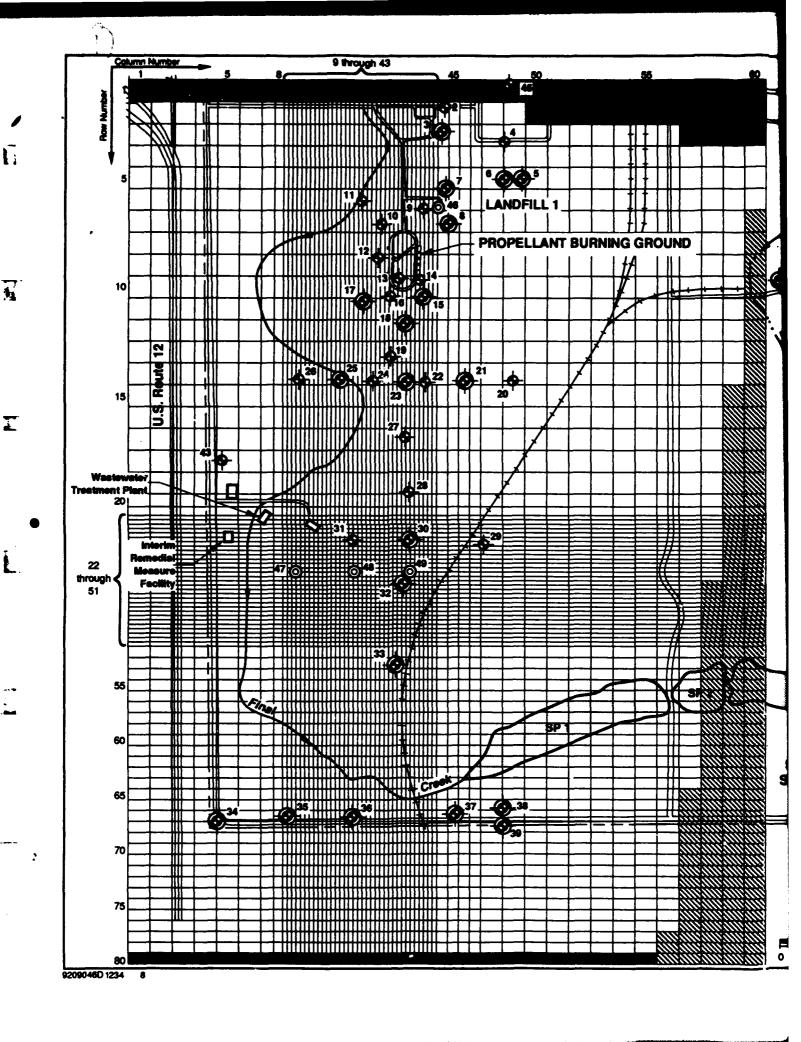


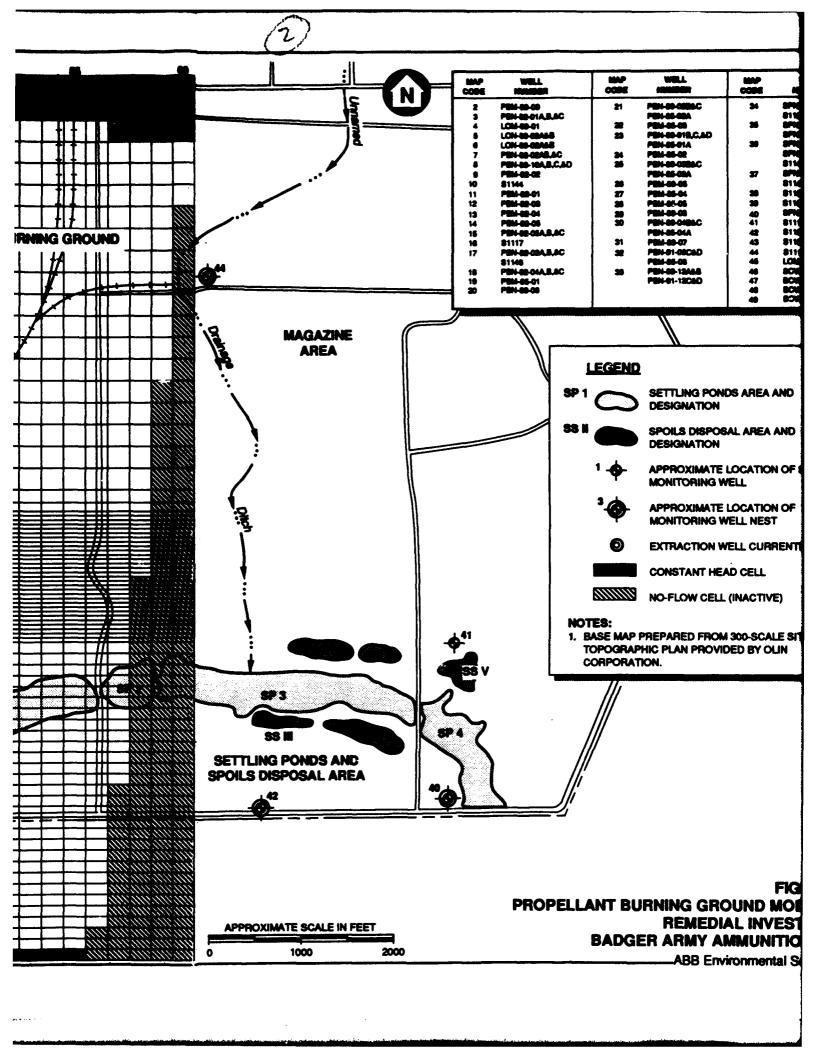
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FIGURE 6-18 BOX MODEL LAYERS REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.-







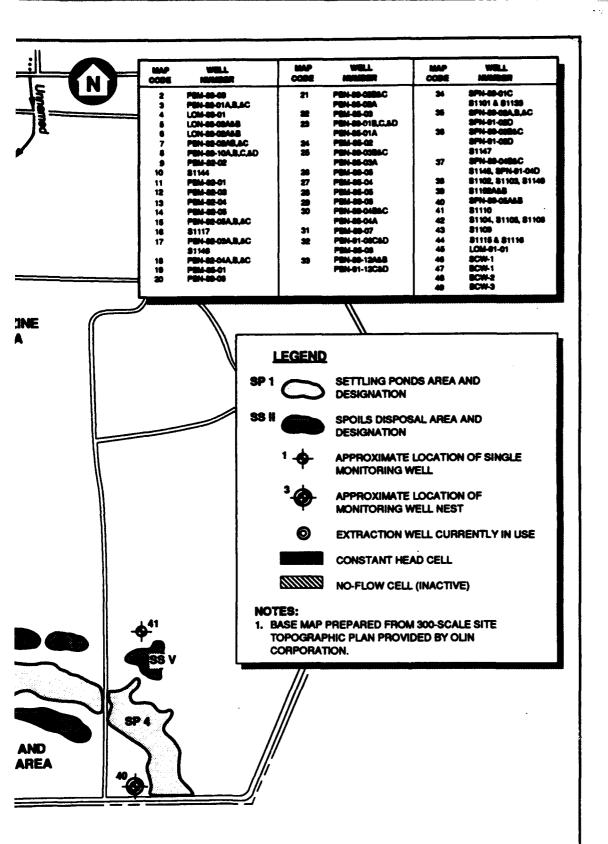


FIGURE 6-20 PROPELLANT BURNING GROUND MODEL GRID REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.

E IN FEET

Model Layer	Pum	Thickness (feet)	
	Unsaturated Zone (Sand)	·	
1	Sand	K = 195 ft/day	55
2	Gravel	K = 240 tr/day	15
3	Sand	K = 195 ft/day	60-85
4	Sand	K = 195 ft/day	20
5	Gravel	K = 240 ft/day	5-35

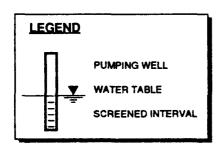
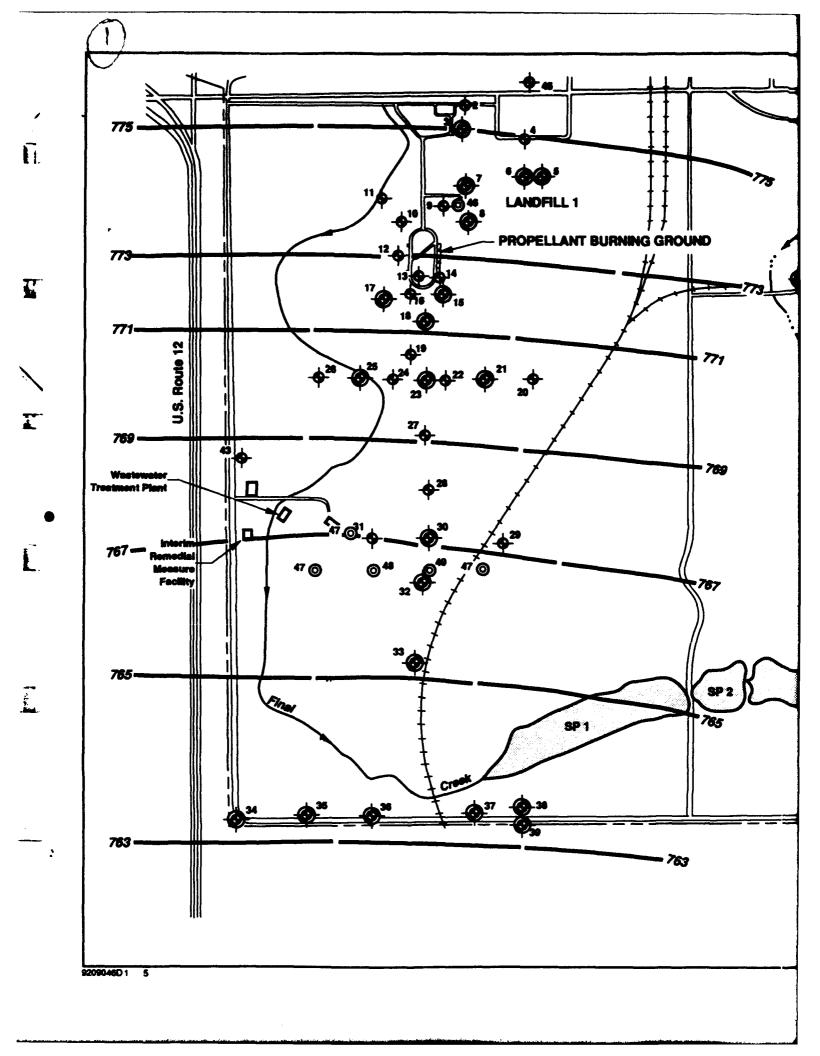
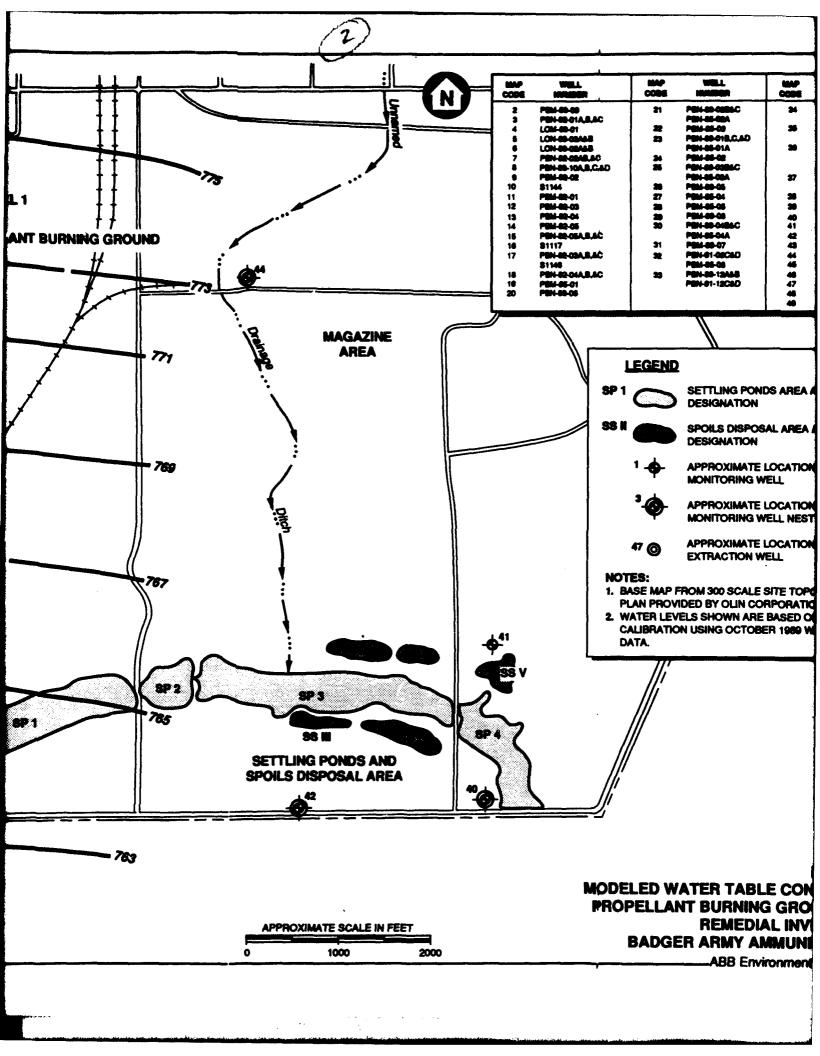


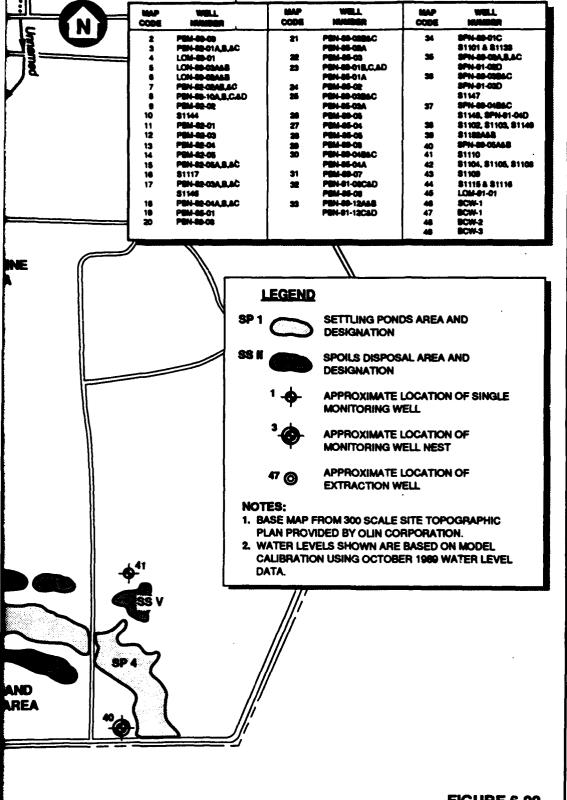
FIGURE 6-21
PROPELLANT BURNING GROUND
MODEL LAYERS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

NOT TO SCALE

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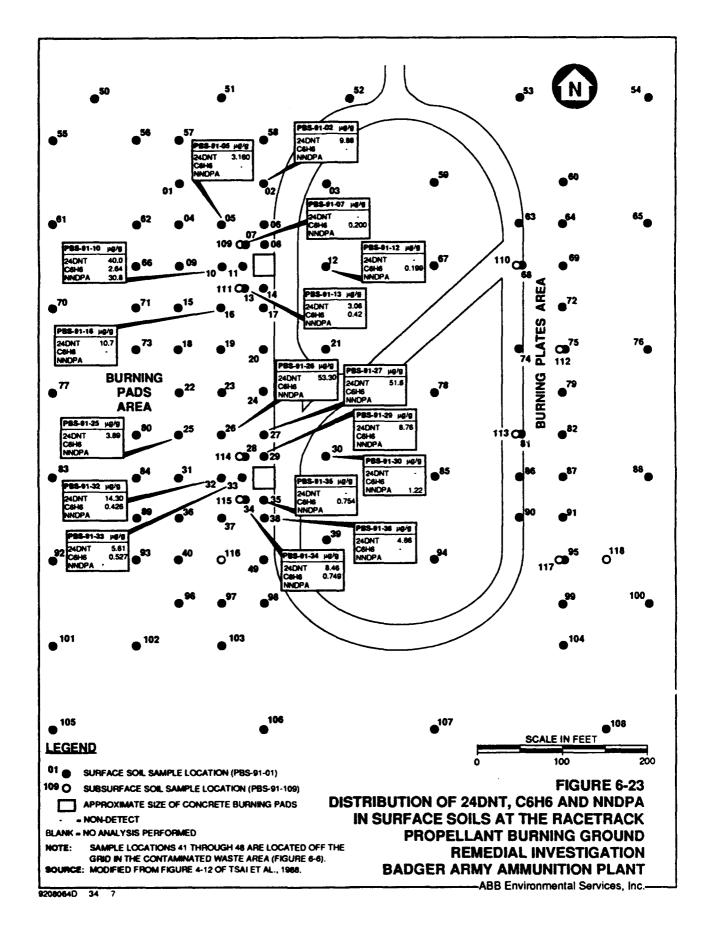
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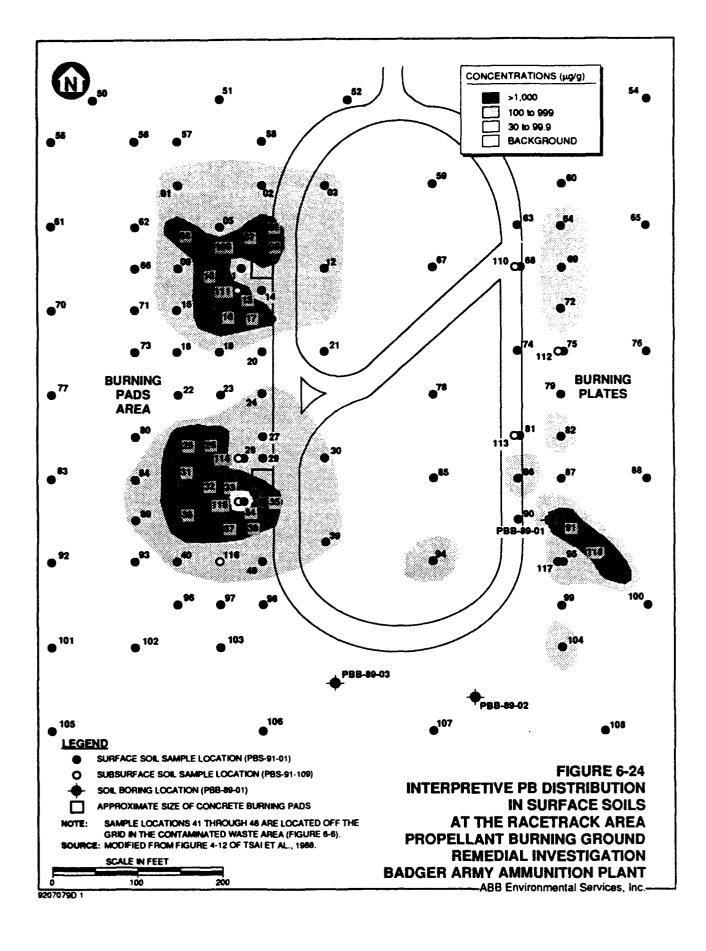
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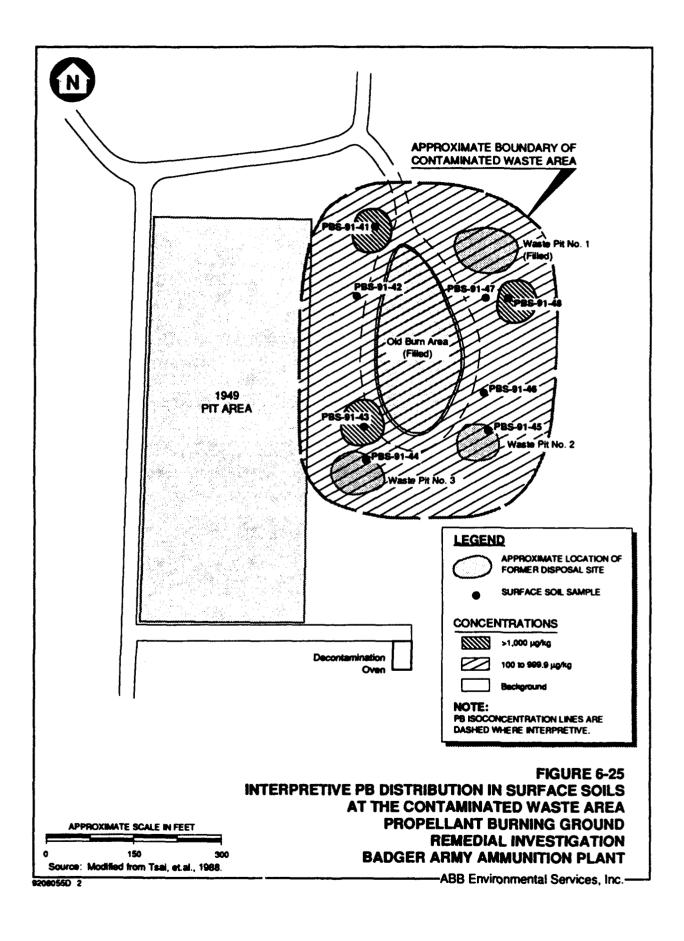
FIGURE 6-22
MODELED WATER TABLE CONTOUR PLAN
PROPELLANT BURNING GROUND MODEL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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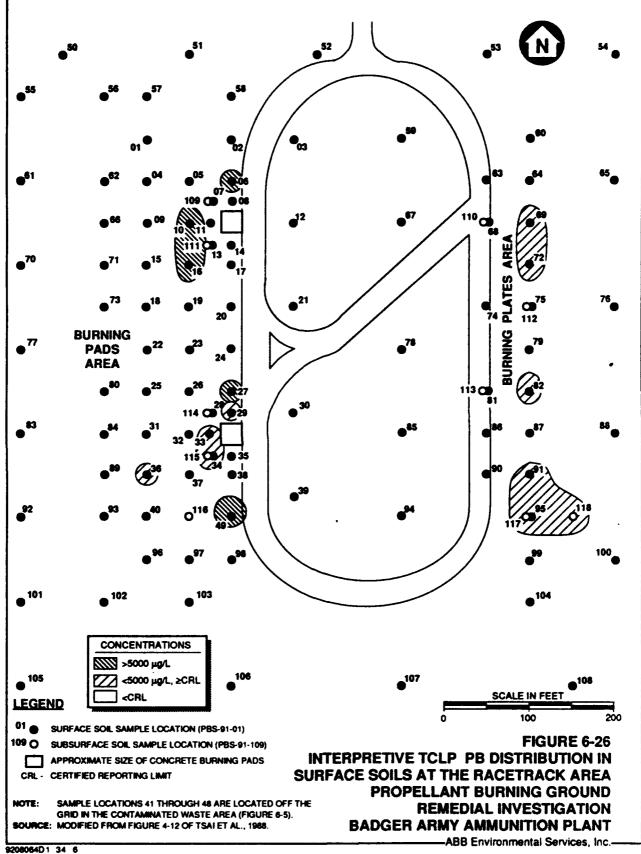
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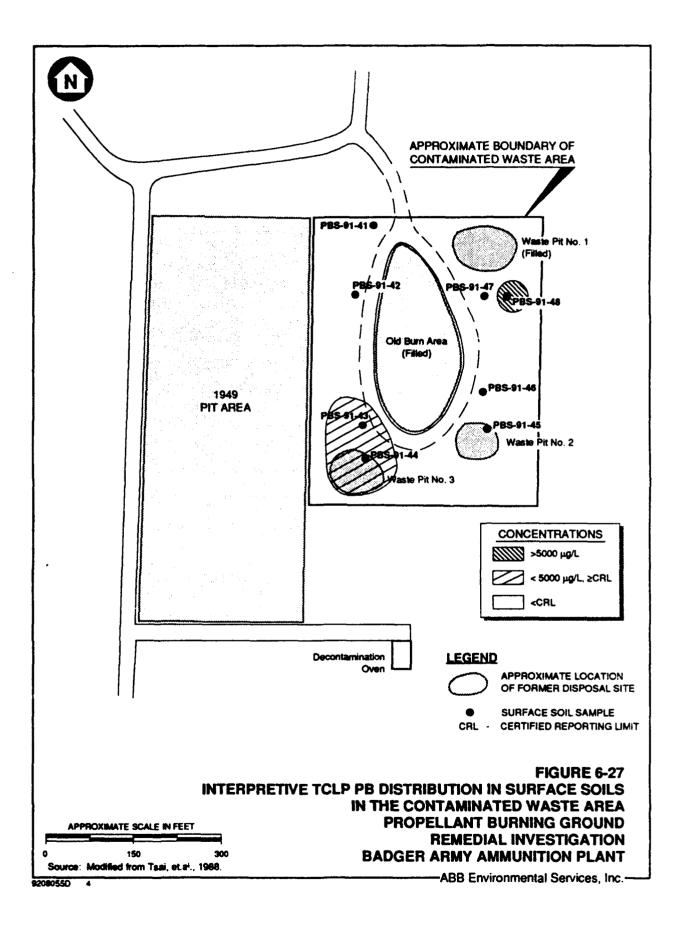


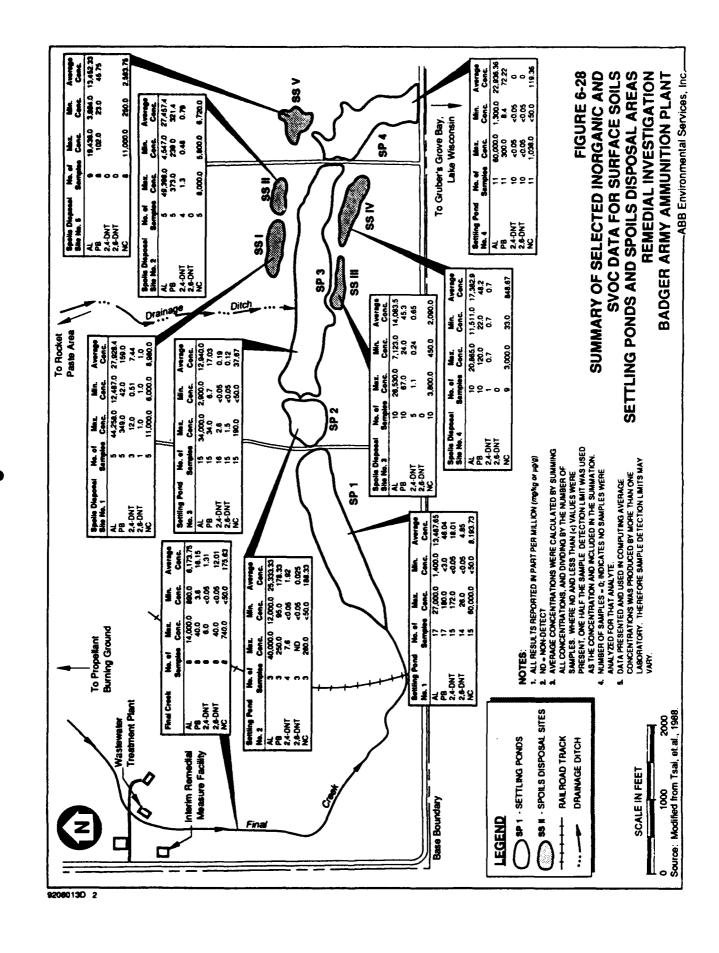


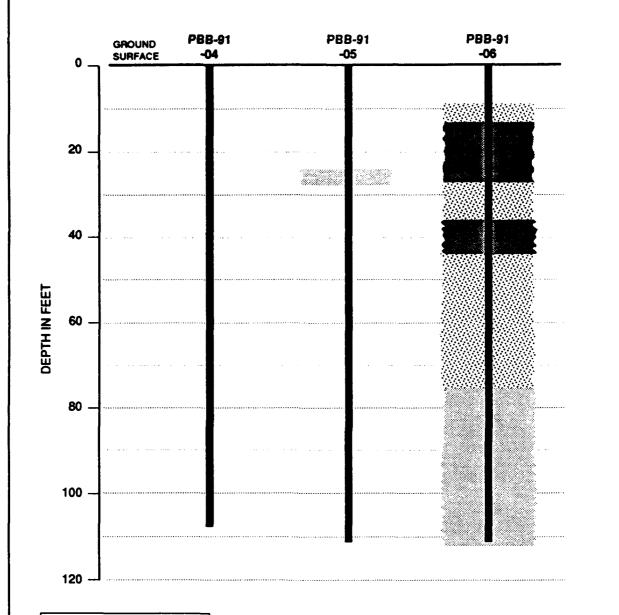


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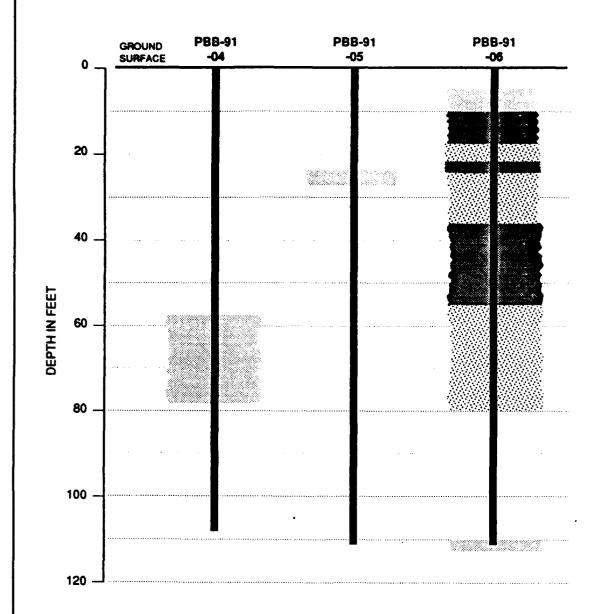


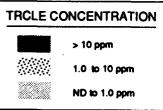
> 100 ppm 1.0 to 100 ppm ND to 1.0 ppm

NOTE

1. SEE TABLE 6-16 AND APPENDIX K FOR CHEMICAL DATA SUMMARY. FIGURE 6-29
INTERPRETIVE C6H6 CONCENTRATIONS IN
SUBSURFACE SOILS
PROPELLANT BURNING GROUND WASTE PITS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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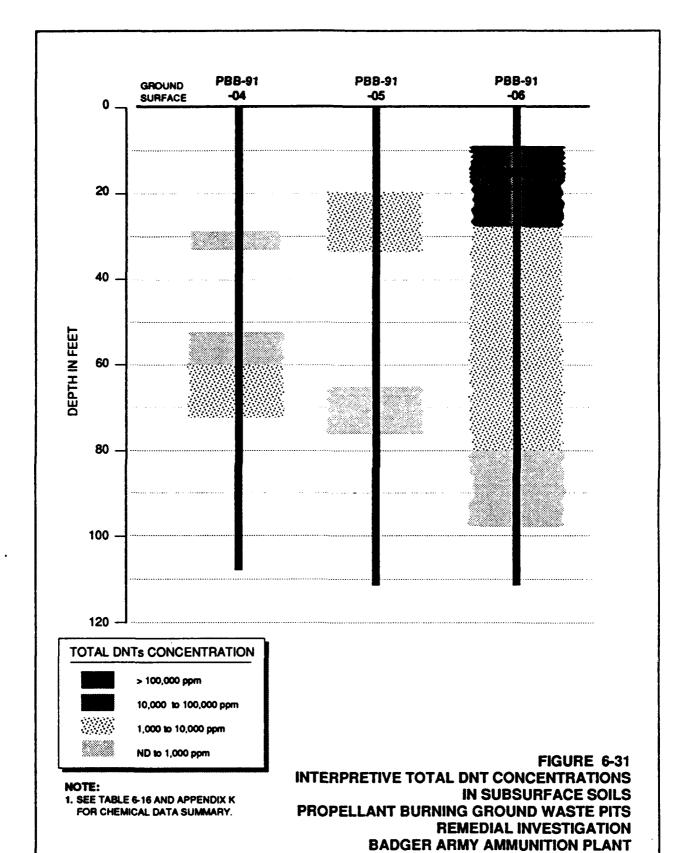




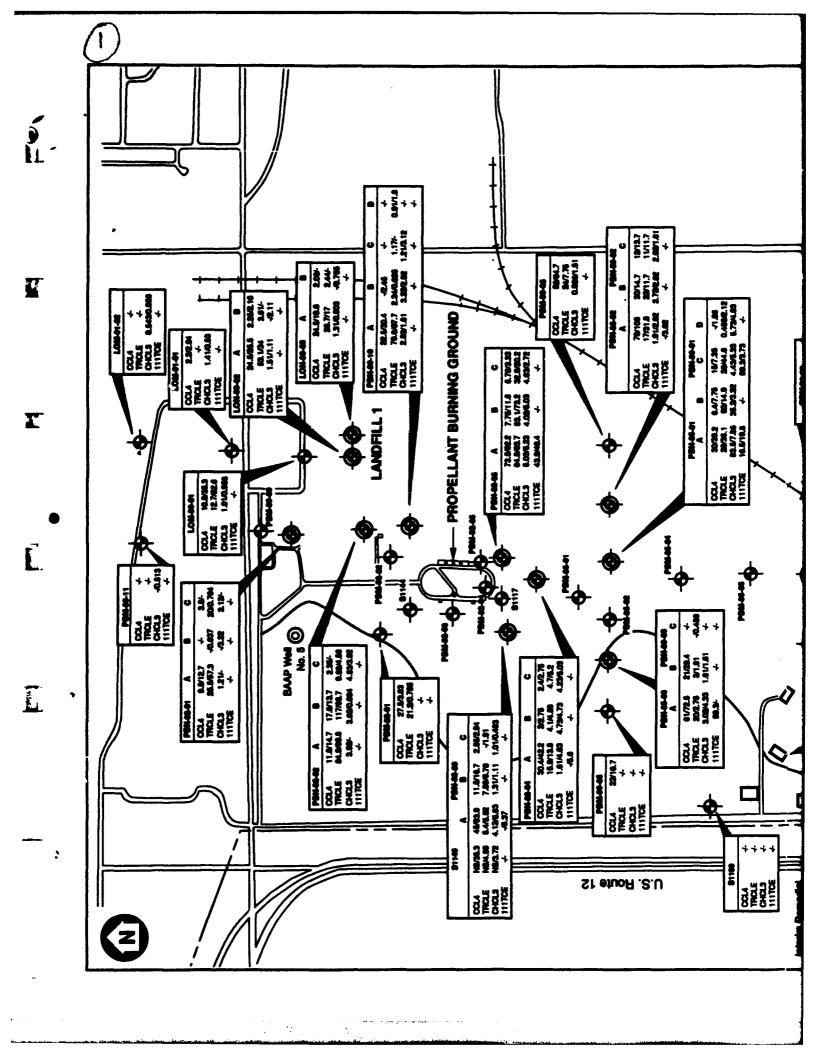
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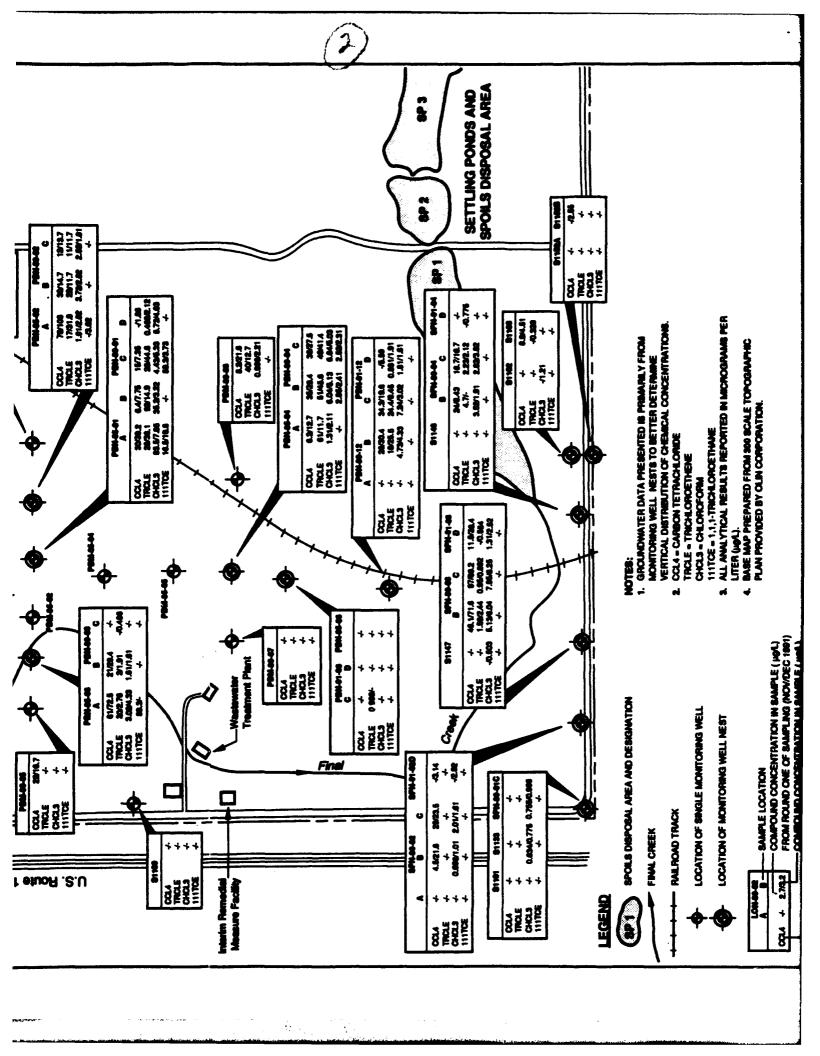
1. SEE TABLE 6-16 AND APPENDIX K FOR CHEMICAL DATA SUMMARY. FIGURE 6-30
INTERPRETIVE TRCLE CONCENTRATIONS IN
SUBSURFACE SOILS
PROPELLANT BURNING GROUND WASTE PITS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

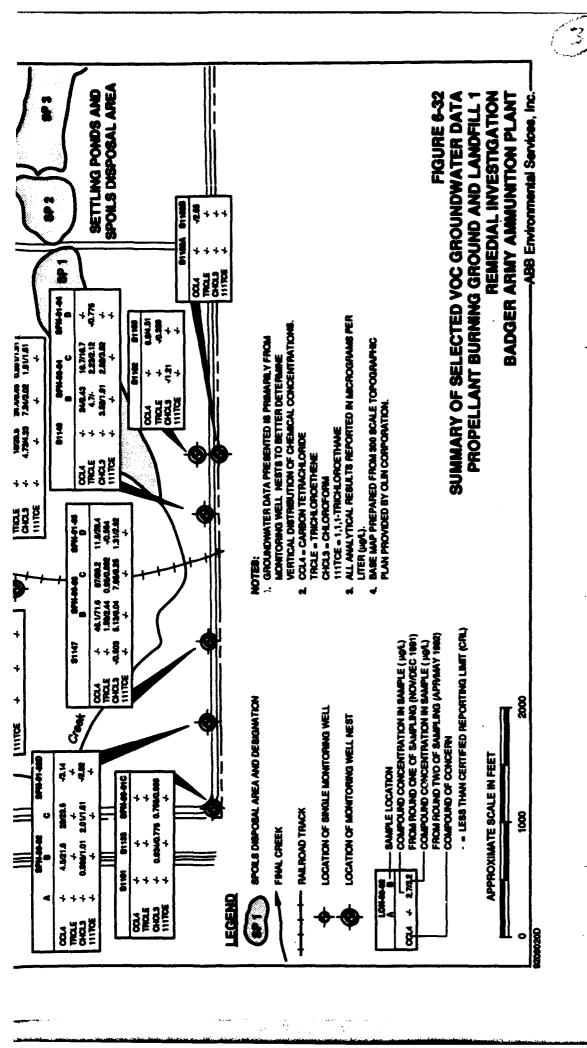
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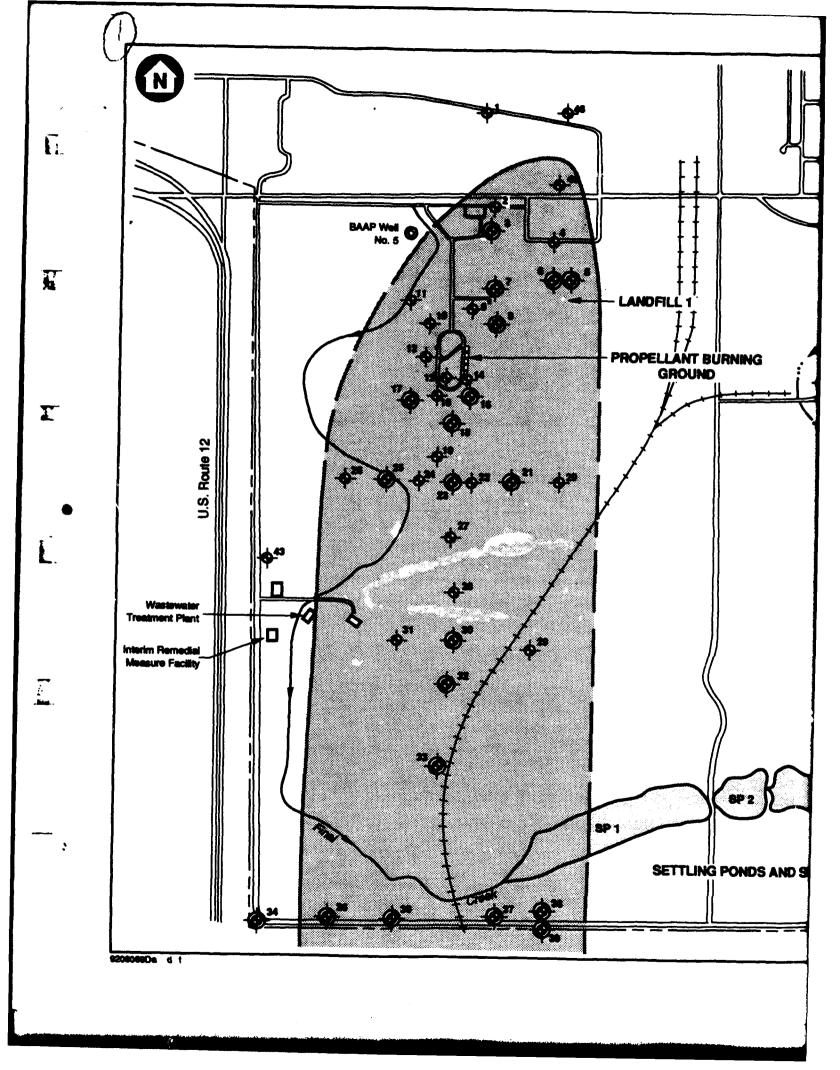
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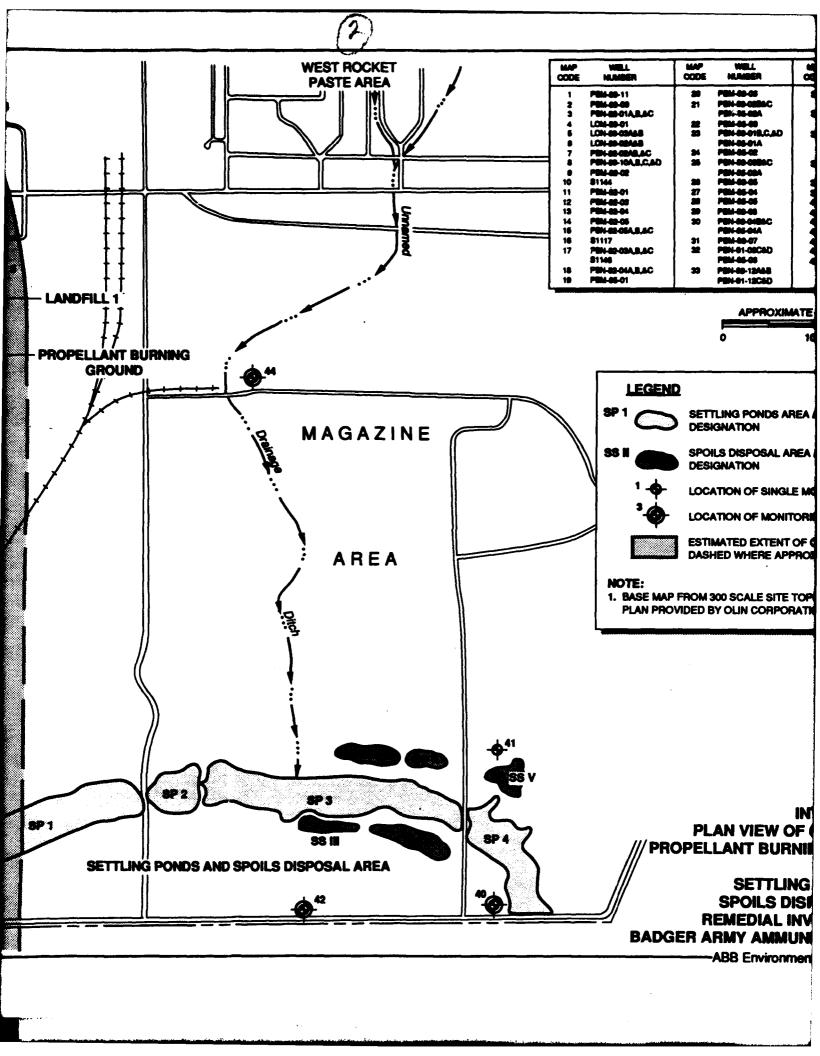


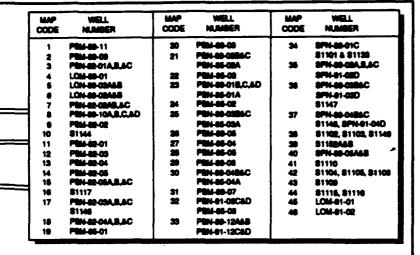




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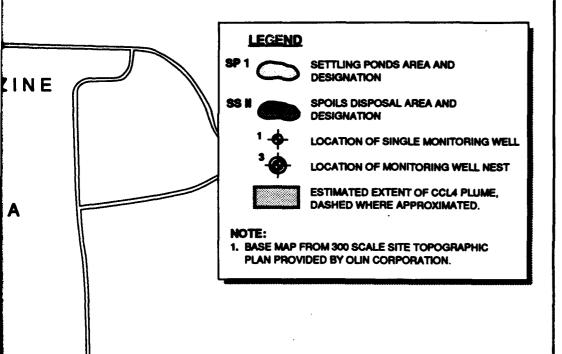




APPROXIMATE SCALE IN FEET

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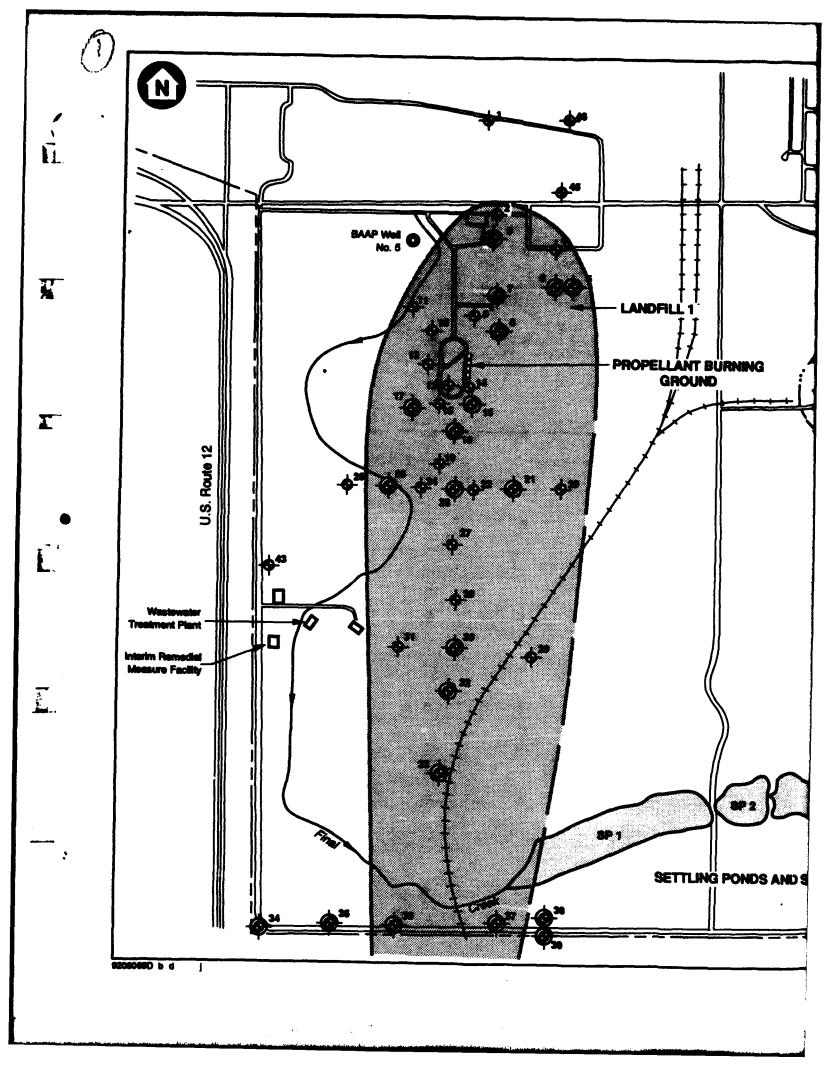
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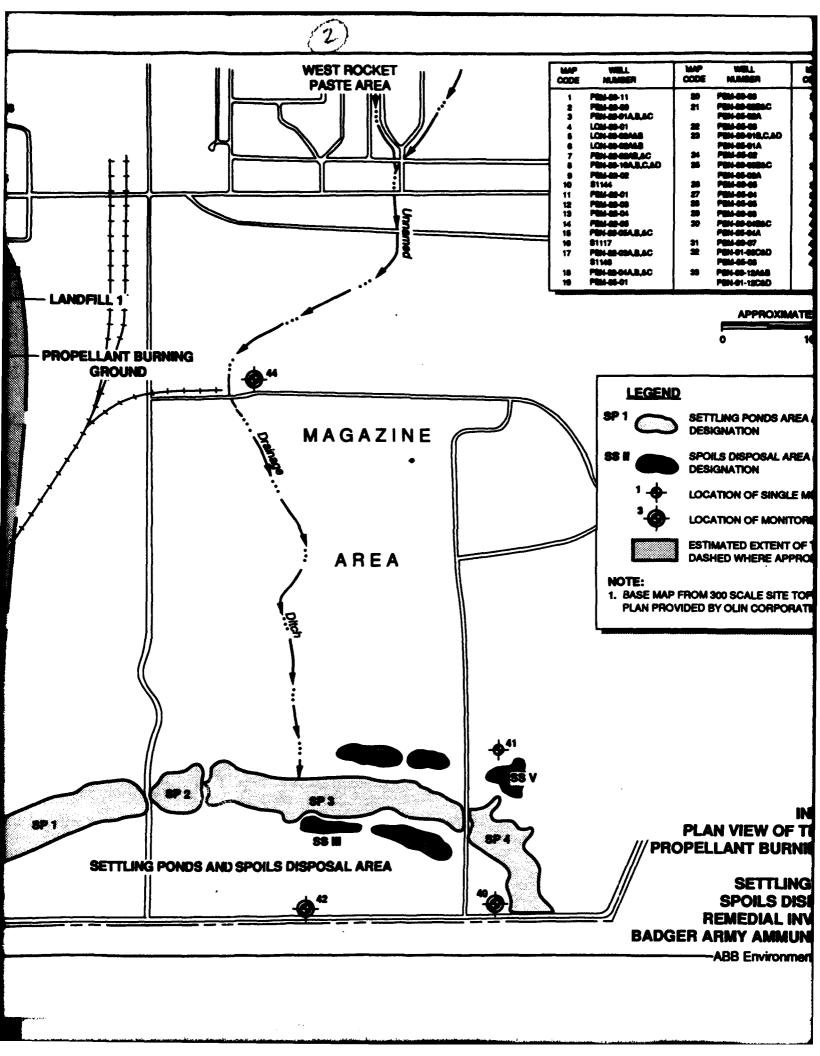


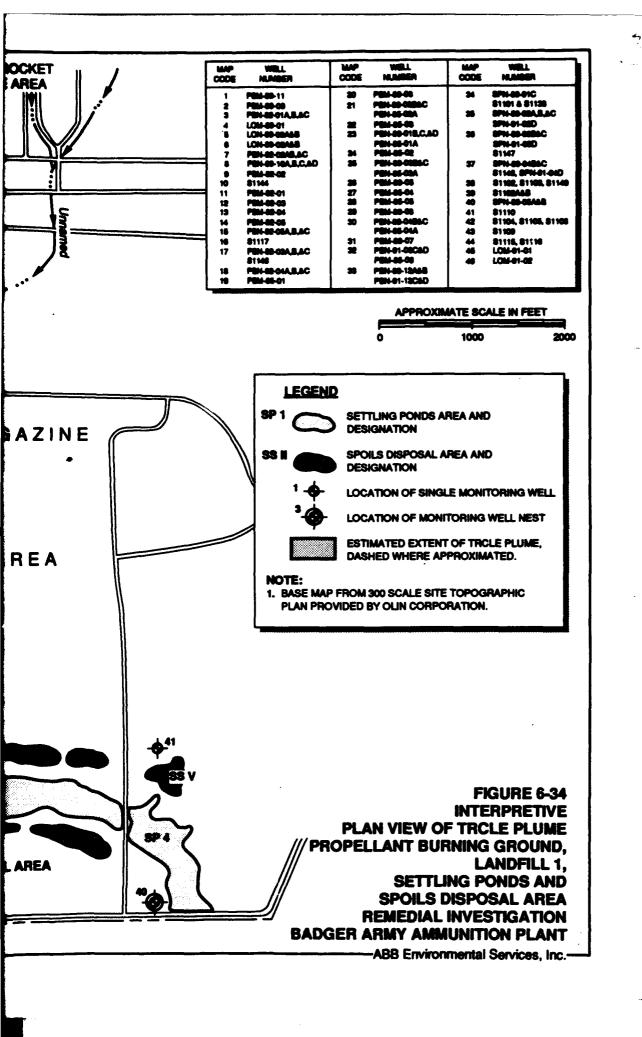
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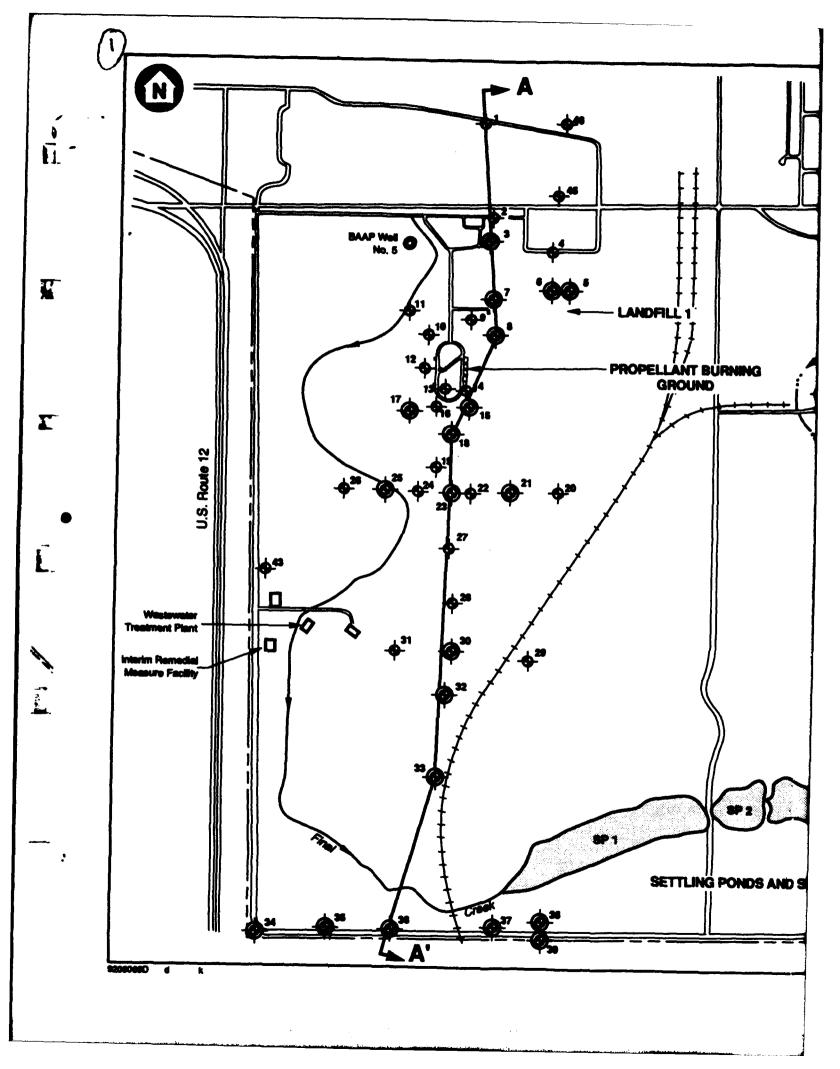
FIGURE 6-33
INTERPRETIVE
PLAN VIEW OF CCL4 PLUME
PROPELLANT BURNING GROUND,
LANDFILL 1,
SETTLING PONDS AND
SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

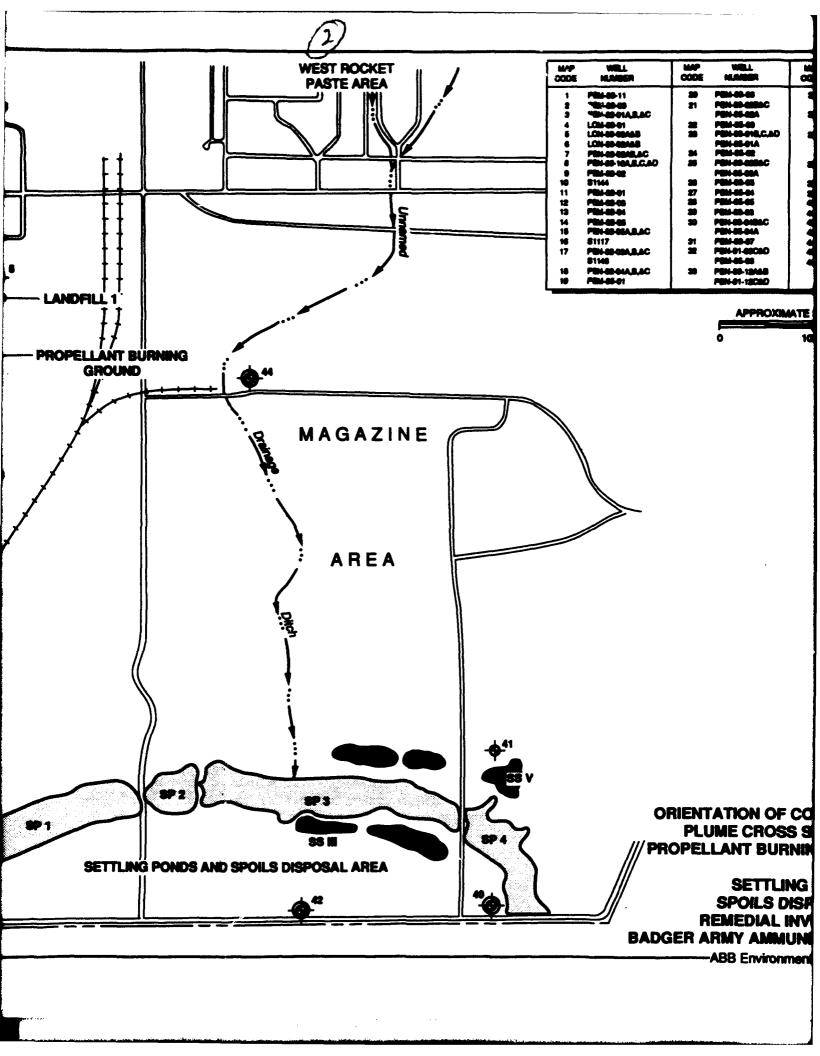
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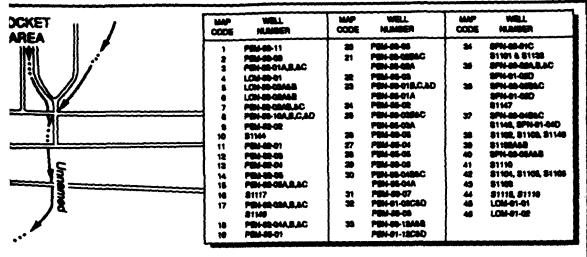




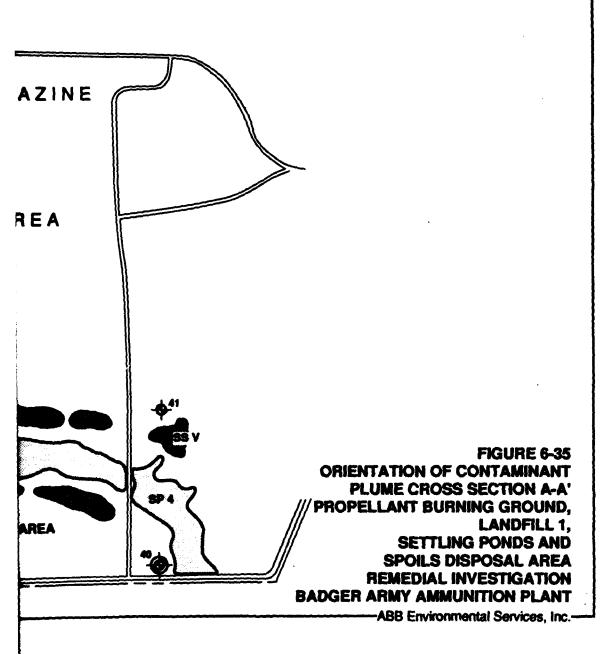


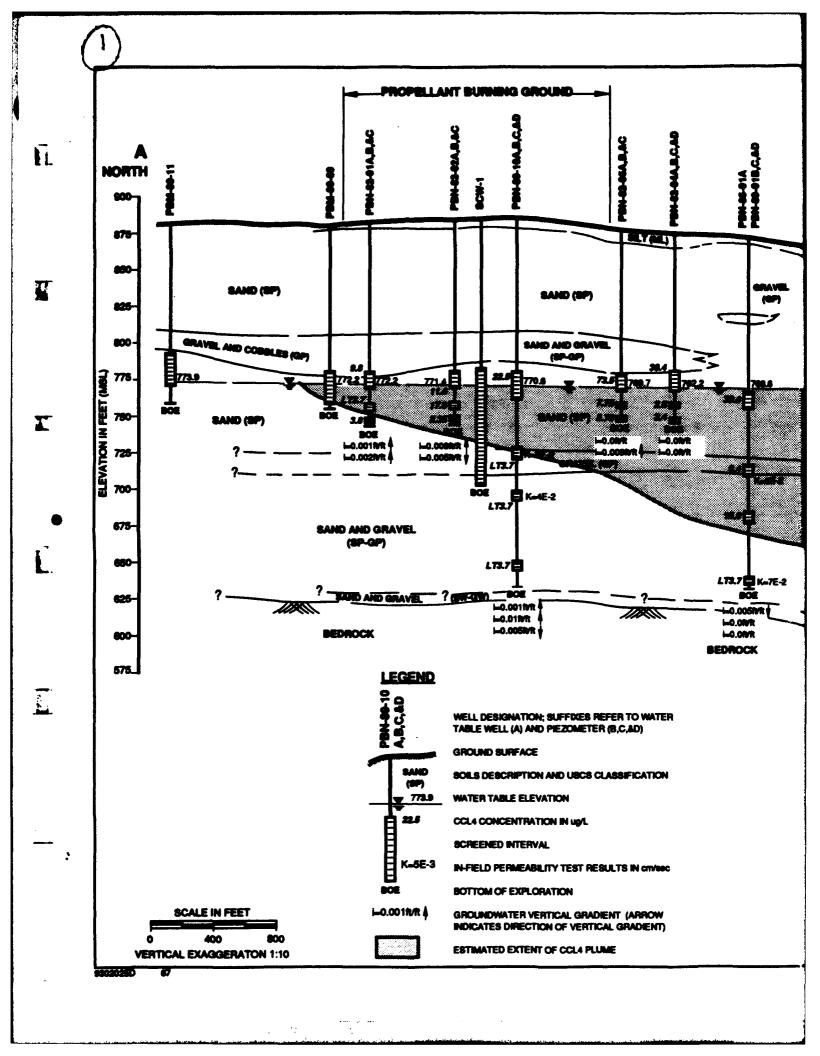


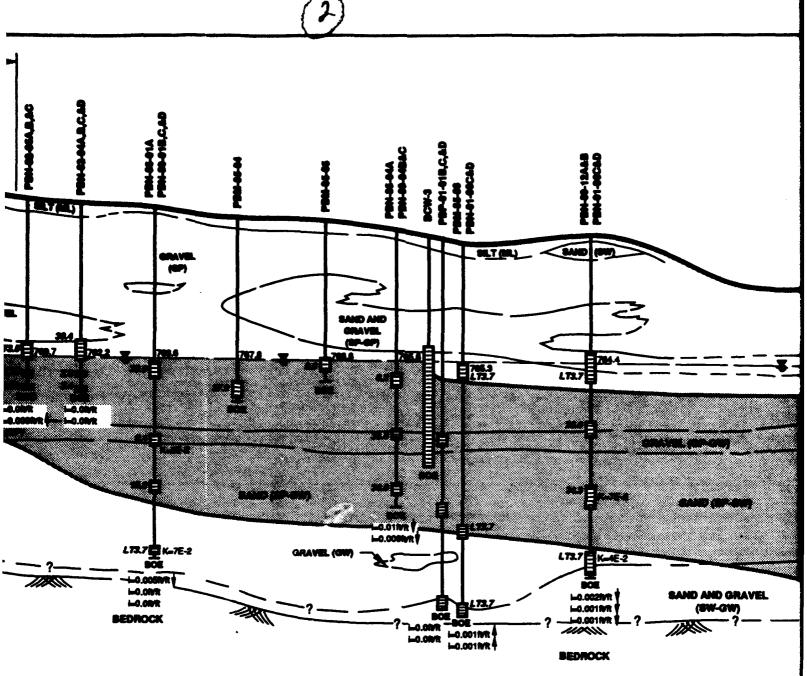




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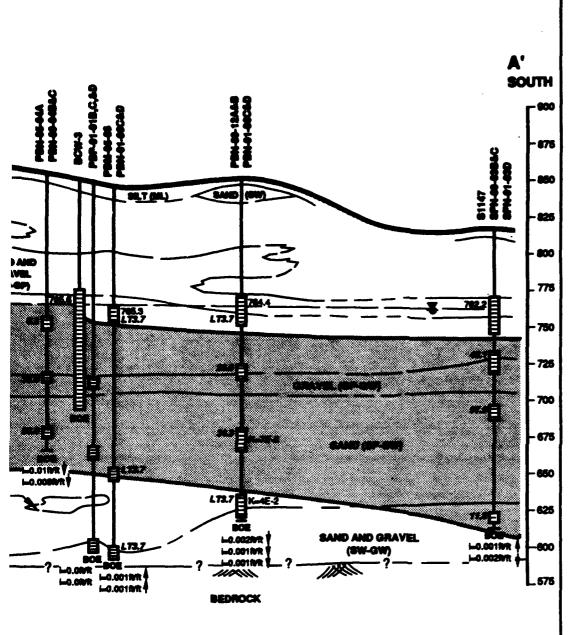
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HENT (ARROW CAL GRADIENT) NOTES:

- 1. SEE FIGURE 2-2 FOR LOCATION AND ORIENTATION OF PROFILE.
- PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
- S. ON MULTIPLE WELL NESTS, GRADIENTS ARE LISTED IN ORDER OF SHALLOW TO DEEP WELLS; i.e., A TO B, B TO C AND C TO D.
- 4. WATER LEVELS MEASURED IN WATER TABLE WELLS ON 12/15/91 ARE LISTED.
- 5. SEDROCK SURFACE ELEVATION ESTIMATED FROM PSB-00-10 AND PRODUCTION WELL NO. 5.
- 8. BEDROCK SUPFACE ELEVATION ESTIMATED FROM PBN-69-12D (LOCATED ADJACENT TO PBN-69-19), SPN-91-04D (LOCATED APPROXIMATELY 1200 FEET EAST OF SPN-91-03D), AND PRODUCTION WELL NO. 5 (LOCATED APPROXIMATELY 1000 FEET NORTH OF PBN-69-19).
- 7. PBP-91-918,C.AD IS USED ONLY FOR GEOLOGIC INFORMATION AND AQUIFER ANALYSIS. IT IS NOT A MONITORING WELL CLUSTER.

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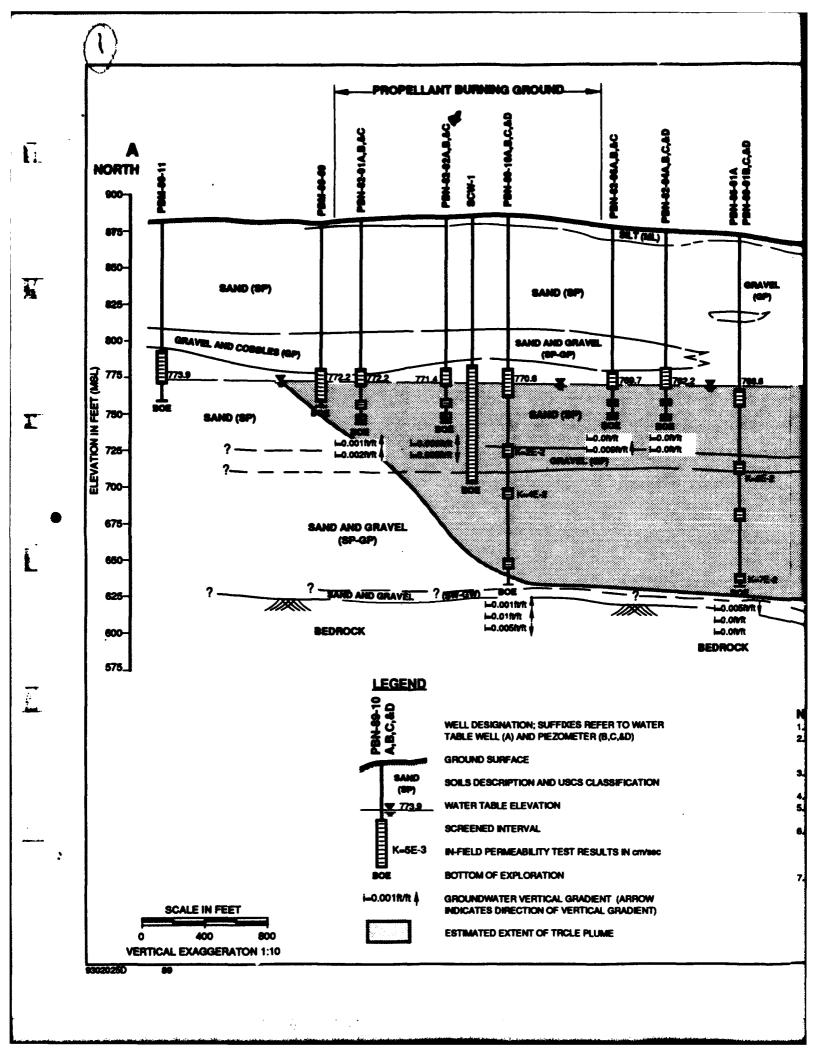


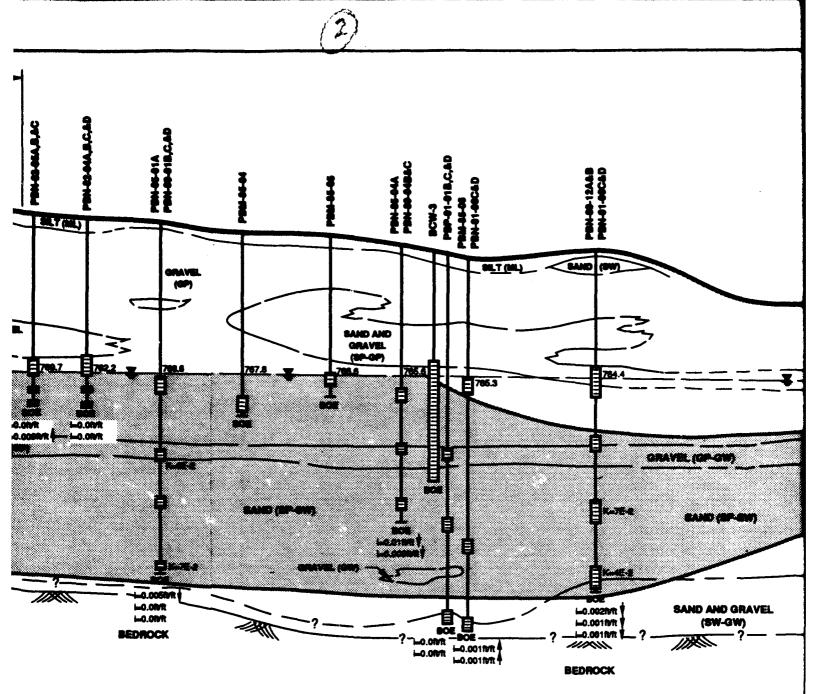
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ADJENTS ARE LISTED IN ORDER OF SHALLOW TO G AND G TO D. MATER TABLE WELLS ON 12/15/01 ARE LISTED. N ESTIMATED FROM P88-00-10 AND

N ESTIMATED FROM PSN-49-12D (LOCATED 41-04D (LOCATED APPROXIMATELY 1200 FEET XULCTION WELL NO. 5 (LOCATED XITH OF PSN-49-14). FOR GEOLOGIC INFORMATION AND ACUIFER IRING WELL CLUSTER. FIGURE 6-36
CONTAMINANT PLUME
CROSS SECTION - CCL4
PROPELLANT BURNING GROUND,
SETTLING POINDS AND
SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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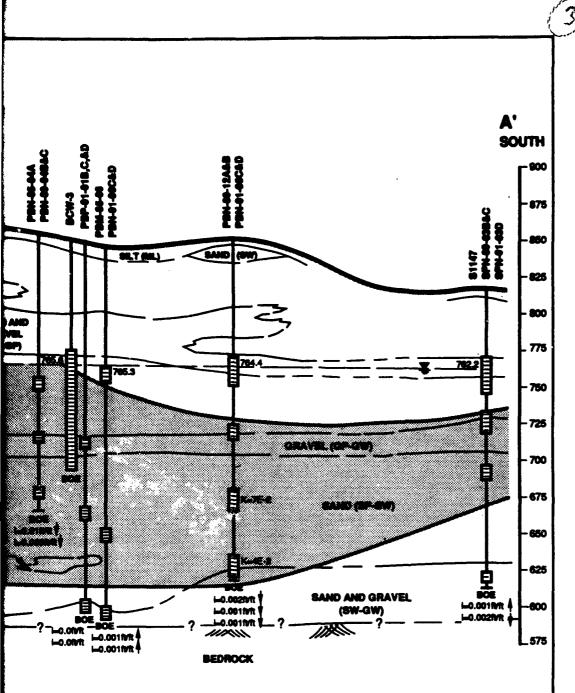
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NOTES:

- 1. SEE FIGURE 2-2 FOR LOCATION AND ORIENTATION OF PROFILE.
- PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
- 3. ON MULTIPLE WELL NESTS, GRADIENTS ARE LISTED IN ORDER OF SHALLOW TO DEEP WELLS; i.e., A TO B, B TO C AND C TO D.
- 4. WATER LEVELS MEASURED IN WATER TABLE WELLS ON 12/15/91 ARE LISTED.
- 5. BEDROCK SIMPACE ELEVATION ESTIMATED FROM PBB-89-10 AND PRODUCTION WELL NO. 5.
- 6. BEDROCK SURFACE ELEVATION ESTIMATED FROM PBN-69-12D (LOCATED ADJACENT TO PBN-89-10), SPN-91-04D (LOCATED APPROXIMATELY 1200 FEET EAST OF SPN-91-03D), AND PRODUCTION WELL NO. 5 (LOCATED APPROXIMATELY 1000 FEET NORTH OF PBN-89-10).
- 7. PBP-91-01B,C,AD IS USED ONLY FOR GEOLOGIC INFORMATION AND AQUIFER ANALYSIS. IT IS NOT A MONITORING WELL CLUSTER.

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CROSS SECTION
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SETTLING POPULS DISPORT
REMEDIAL INVERSE
BADGER ARMY AMMUNIT

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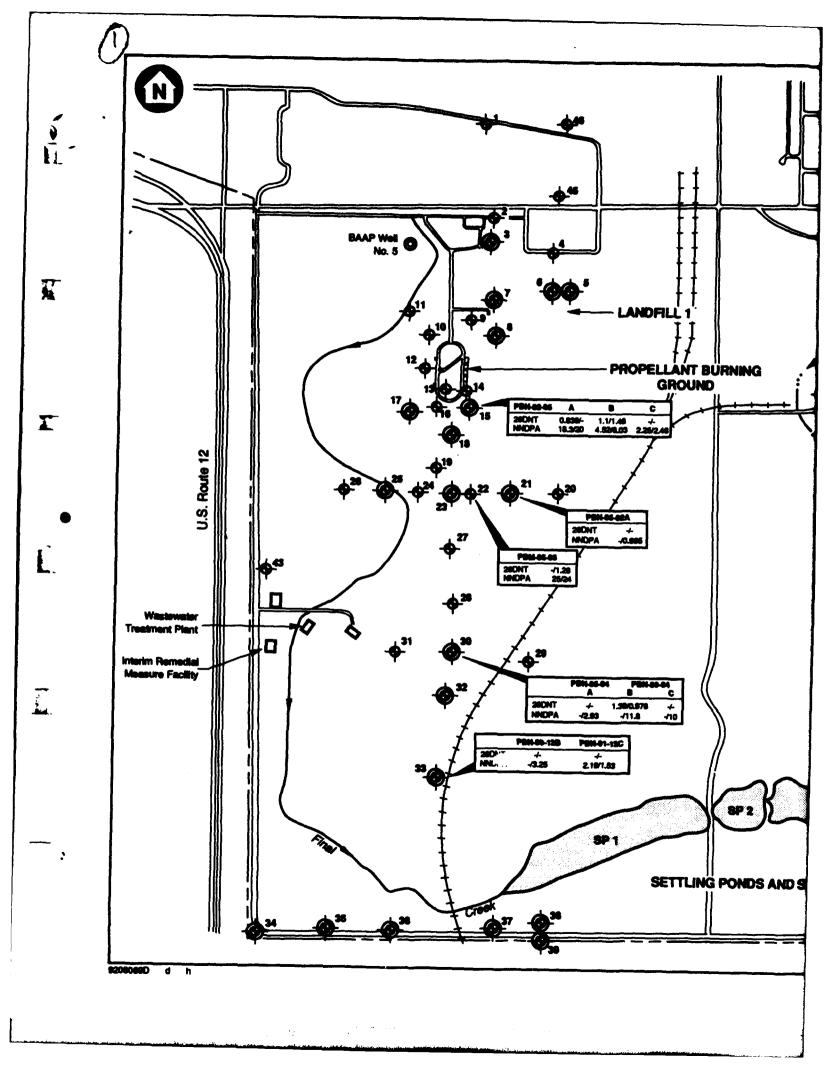
ESTIMATED FROM PSN-00-12D (LOCATED 1-04D (LOCATED APPROXIMATELY 1200 FEET DUCTION WELL NO. 5 (LOCATED ITH OF PSN-00-10). POR GEOLOGIC INFORMATION AND AQUIFER

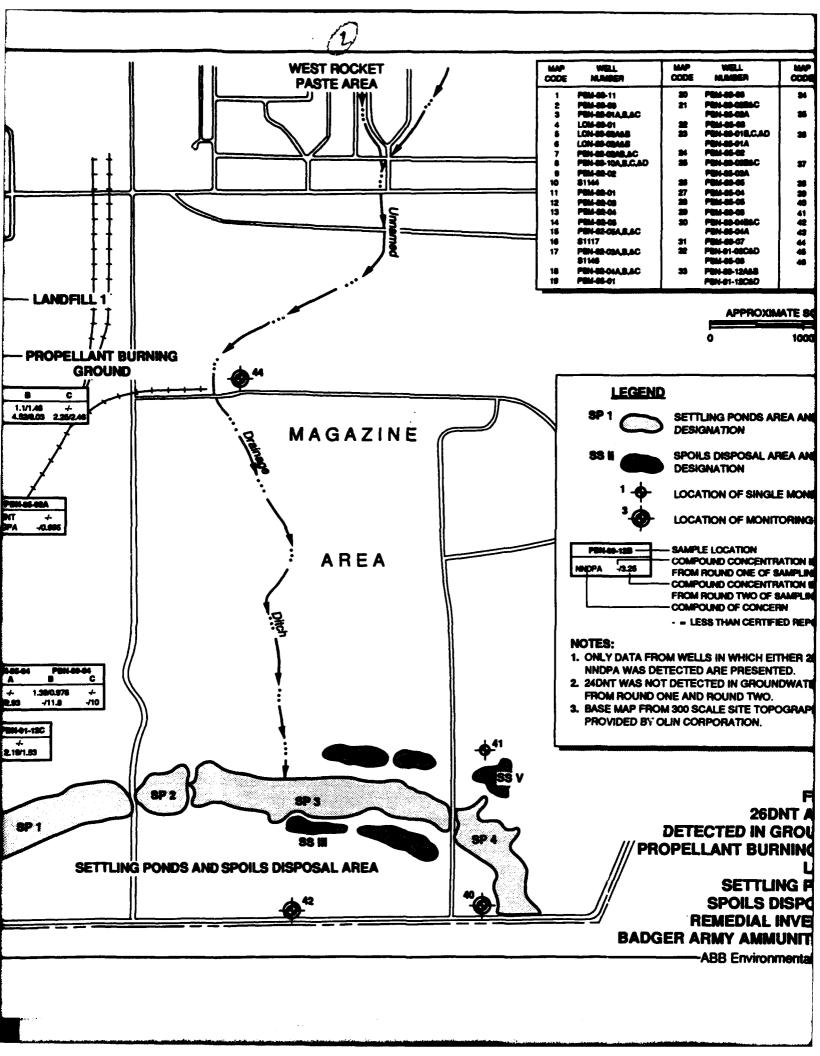
NG WELL CLUSTER.

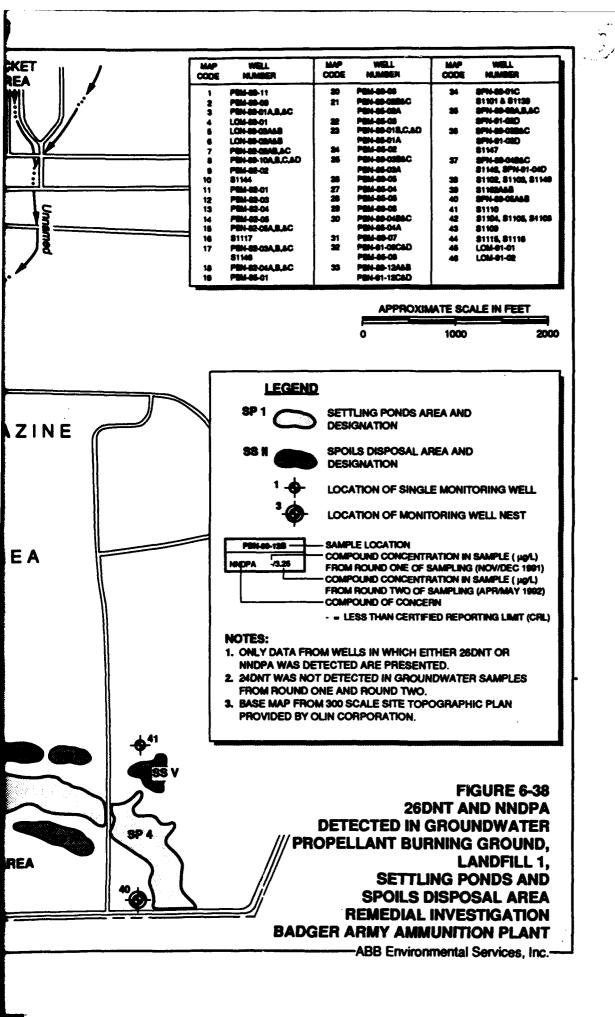
FIGURE 6-37
CONTAMINANT PLUME
CROSS SECTION - TRCLE
PROPELLANT BURNING GROUND,
SETTLING POINDS AND
SPOILS DISPOSAL AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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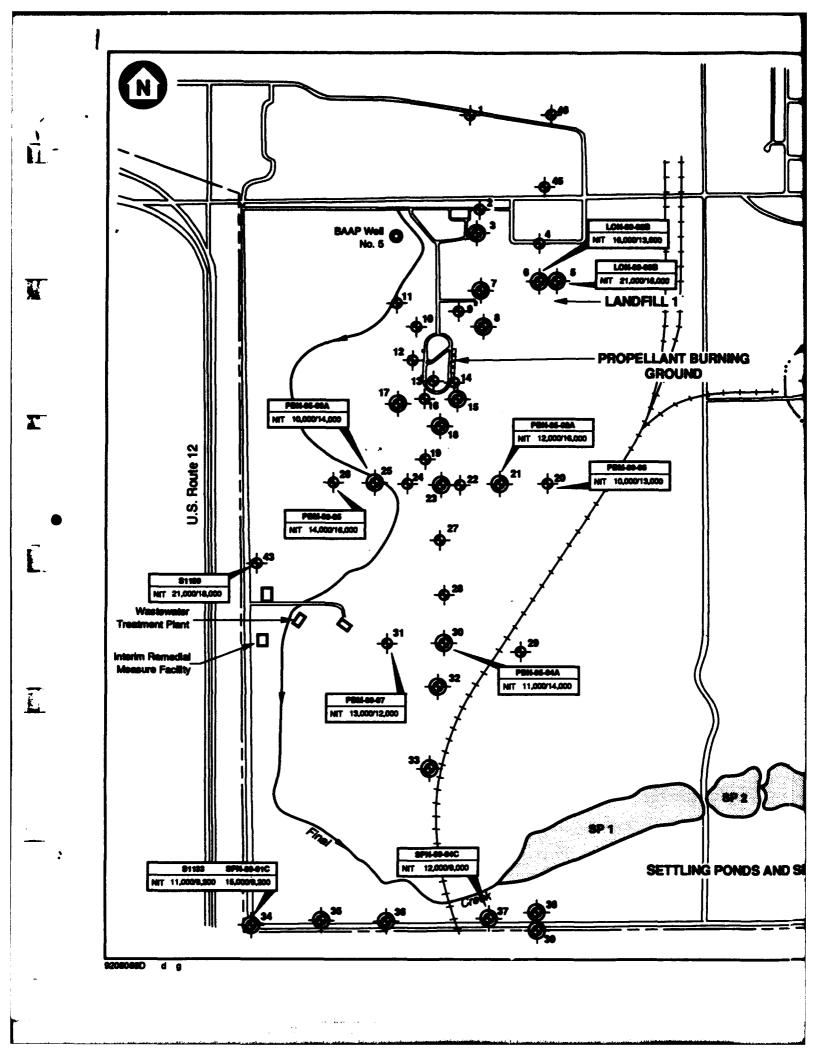
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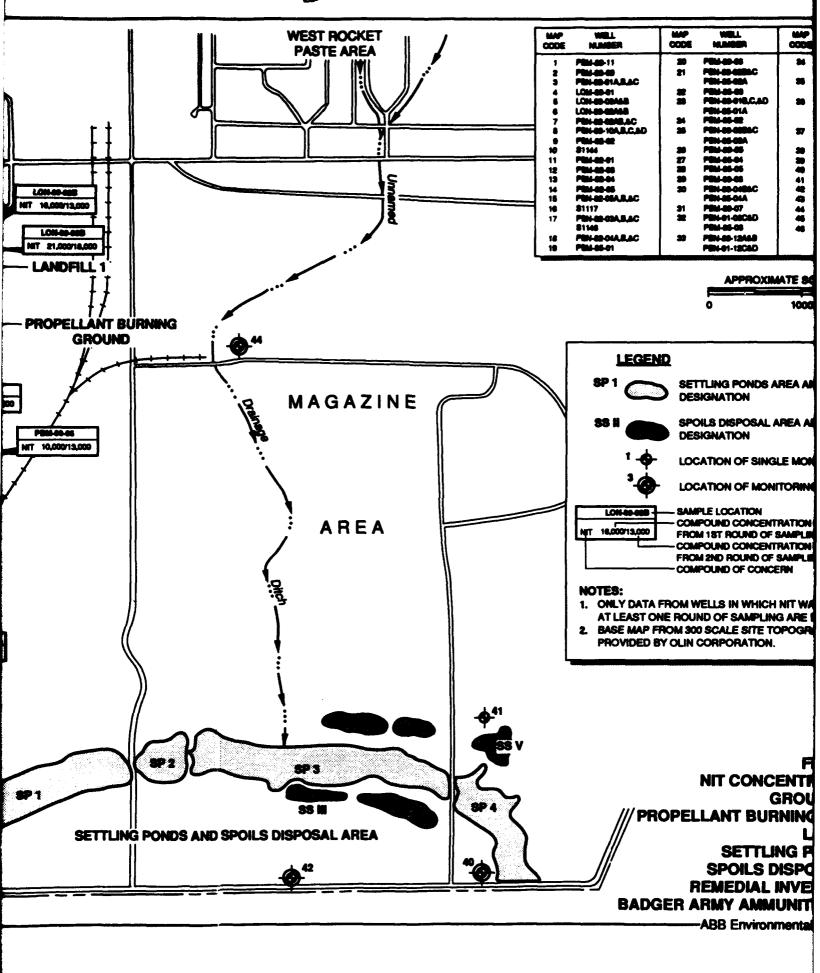


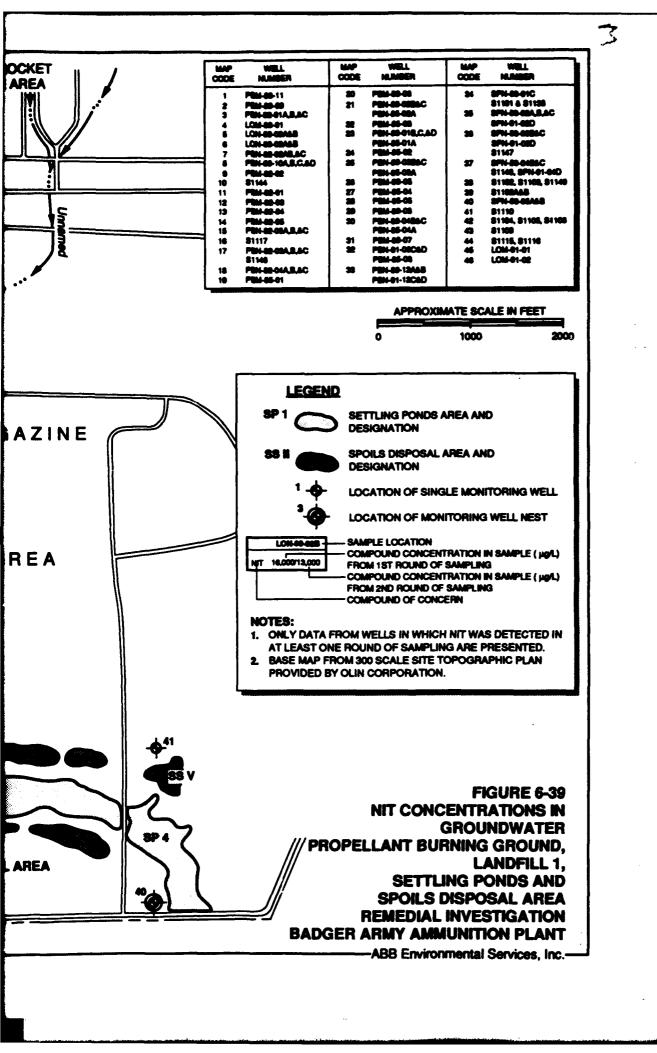




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SUMMARY OF THE REMEDIAL INVESTIGATION FIELD PROGRAM -DETERRENT BURNING GROUND/EXISTING LANDFILL TABLE 7-1

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

		d	Program Elements	
8птез	SOIL VAPOR SURVEY	REMOTE SENSING GEOPHYSICS	MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING*	SOIL BORINGS AND SOIL SAMPLING
Deterrent Burning Ground VOC-SST/MS, 110 collectors	VOC-SST/MS, 110 collectors	GBHL at 4 wells, GPR and TC	7 new wells; 24 samples from 7 new and 5 existing wells	3 soli borings with a total of 44 analytical soil samples.
Existing Landfill	:	GBHL at 4 wells	14 new wells; 58 samples from 14 new and 15 existing wells	-

Notes:

GBHL = Geophysical Borehole Logging
GPR = Ground Penetrating Radar
TC = Terrain Conductivity
VOC-SST/MS = Volatile Organic Compounds · Surface Static Trapping/Mass Spectrometry
* includes 2 rounds of groundwater sampling

TABLE 7-2
SUMMARY OF BORINGS COMPLETED DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Boning Number	DEPTH OF SOIL BORING FROM GROUND SURFACE (ft)	TOTAL NUMBER OF SPLIT-SPOON SAMPLES	NUMBER OF SUBSURFACE SOIL SAMPLES FOR CHEMICAL ANALYSIS	Punpose
Deterrent Burning Ground				
DBB-91-01	117	19	91	Borings were made at the locations of the former Deterrent Burning Pits to provide
DBB-91-02	122	22	14	chemical data to characterize the type and vertical distribution of contaminants in the
DBB-91-03	122	22	14	unsaturated solls below the burning pits.

CHEMICAL ANALYSES PERFORMED ON SUBSURFACE SOIL SAMPLES -DETERRENT BURNING GROUND/EXISTING LANDFILL TABLE 7-3

REMEDIAL INVESTIGATION BADGER APAY AMMUNITION PLANT

							_	NORGANICE	SEC 8						ľ		T		P	3	3	Γ
				METALS	Ø,			-	TCLP	METAL	8	F	3	_								
SAMMELE LOCATION PP TAL CD CR HG FE NI PB CD CR HG PB NIT 804 TOC pH TPHC VOC BNUA NA NAM DAT	£	로	8	8	9	۳	Ī	2	8	క	9	<u>_</u>	¥	<u>_</u>	8	ī	É	8	¥	3	3	토
DETERMENT BURNING	BEROL	9																				Γ
D88-81-01	•	I	l	ı	1	1	1	ı	2	9	5	5	5	2	ı	1	ı	=	=	5	2	2
D88-01-02	7	ŧ	1	1	1	1	1	1	=	=	=	=	=	=	ı	ı	1	=	Z	Ξ	=	=
DBB01-03	=	I	1	1	1	1	1	1	=	=	=	=	=	=	ı	ı	1	7	=	=	=	:
TOTALS	4	•	•	•	•		•	•	:	4	4	\$	\$	\$	•	•	•	4	4	3	\$	4

NOTES:

PP = Priority Pollutant Metals (13) (AG, AS, BE, CD, CR, CU, PB, HG, MI, SB, SE, TL, ZN)
TAL = Toode Analyte List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)
VOC = voletitle organic compounds by GCMS GCAMS = Gas ChromatographyMass Spectrometry
BN/A = bass-neutral and acid-extractable organics by GCAMS
NAM = nitrosamines by GC

DNT = 2,4- and 2,6-dinitrotoluene by HPLC

HPLC = High Performance Liquid Chromatrography

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TABLE 7-4
SUMMARY OF MONITORING WELLS INSTALLED DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Site and Well. Identifier	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	Purpose
Deterrent Burning Area	Area					
DBM-89-01	Dual-wall driven casing	127	771.99	20	Downgradient of Deterrent Burning Ground	To provide horizontal definition of the plume south of Deterrent Burning Ground.
DBN-89-02 A DBN-89-02 B	Dual-wall driven casing Dual-wall driven casing	120 160	767.10 731.90	20 5	Downgradient of Deterrent Burning Ground	To provide horizontal and vertical definition of the plume southeast of Deterrent Burning Ground.
DBM-89-03	Dual-wall driven casing	140	766.85	20	Downgradient of Deterrent Burning Ground	To provide horizontal definition of the plume southeast of Deterrent Burning Ground.
DBN-89-04 A	Dual-wall driven casing Dual-wall driven casing	155 180	763.89 731.14	20 5	Upgradient of Deterrent Burning Ground	To define background conditions upgradient of Deterrent Burning Ground; there is a potential for contamination from either the Existing Landfill or the Oleum Plant.
DBM-89-05	Dual-wall driven casing	127	765.43	20	Downgradient of Deterrent Burning Ground	To provide horizontal definition of the plume south of Deterrent Burning Ground.
Existing Landfill						
ELM-89-01	Dual-wall driven casing	166	740.73	23	Downgradient of Existing Landfill	To provide horizontal plume definition downgradient and south of Existing Landfill.
ELN-89-02 A ELN-89-02 B	Dual-wall driven casing Dual-wall driven casing	160 180	773.10 741.19	20 5	Downgradient of Existing Landfill	To provide horizontal and vertical plume definition downgradient and south of Existing Landfill.
ELM-89-03	Dual-wall driven casing	180	765.28	93	Downgradient of Existing Landfill	To provide horizontal and vertical plume definition downgradient and southeast of Existing Landfill

continued

SUMMARY OF MONITORING WELLS INSTALLED - DETERRENT BURNING GROUND/EXISTING LANDFILL TABLE 7-4

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITE AND WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (R. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	Purpose
ELN-89-04 A	Dual-wall driven casing Dual-wall driven casing	168 199	763.43 727.63	20 20	Downgradient of Existing Landfill	To provide horizontal and vertical plume definition downgradient and east of Existing Landfill.
ELM-89-05	Dual-wall driven casing	140	772.95	20	Potentially downgradient of Existing Landfill	To provide background water quality data upgradient of Existing Landfill.
ELN-89-06 B	Dual-wall driven casing	200	725.22	ç	Downgradient of Existing Landfill	To provide horizontal and vertical definition of the plume downgradient of Existing Landfill in association with Existing Well S1153.
ELM-89-07	Dual-wall driven casing	170	764.19	82	Downgradient of ELM-89-03	To provide horizontal plume definition downgradient and southeast of Existing Landtill.
ELM-89-08	Hollow-stem augers	149	759.04	ம	Downgradient of ELN-89-02A and ELN-89-02B	To provide horizontal plume definition downgradient and south of Existing Landfill.
ELM-89-09	Hollow-stem augers	160	765.79	ທ	Downgradient of Existing Landfill	To provide horizontal plume definition downgradient and west of Existing Landfill.
ELN-91-07 A ELN-91-07 B	Dual-wall driven casing Dual-wall driven casing	130 150	769.5 748.9	10 10	Downgradient of all Existing Landfill Wells	To document no impact conditions at downgradient edge of flow systems along BAAP boundary.
ELM-91-10	Dual-wall driven casing	154	766.8	15	Between ELN-89-04 and ELN-89-06 well nests.	To provide horizontal plume definition along BAAP boundary.

Notes: ft MSL

feet Mean Sea Level

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TABLE 7-5
SUMMARY OF MONITORING WELLS LOGGED WITH BOREHOLE GEOPHYSICS DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Sme	:/Weu. No.	BORING DEPTH FROM TOP OF PVC RISER (feet)	APPROXIMATE DEPTH TO WATER FROM TOP OF PVC RISER (feet)	DATE LOGGED	DATE INSTALLED	DRILLING METHOD
1.	DBN-89-04B	190	141	05/09/89	02/07/89	Dual-wall driven casing
2.	DBM-82-02	154	135	05/10/89	03/20/82	Mud rotary
3.	DBN-89-02B	152	107	05/10/89	02/02/89	Dual-wall driven casing
4.	ELM-89-09	157	140	05/10/89	04/13/89	Hollow-stem augers
5 .	ELN-89-02B	181	142	05/10/89	04/18/89	Dual-wall driven casing
6.	ELM-89-03	151	138	05/11/89	01/25/89	Dual-wall driven casing
7.	ELN-89-06B	182	130	05/11/89	04/04/89	Dual-wall driven casing
8.	DBN-82-01C	169	128	05/11/89	03/22/82	Mud rotary
	*DBN-89-04B	190	141	05/11/89	02/07/89	Dual-wall driven casing
9.	ELN-82-02C	164	138	05/14/89	04/02/82	Mud rotary
10.	ELN-89-04B	200	149	05/14/89	04/03/89	Dual-wall driven casing
11.	ELN-82-03C	177	148	05/14/89	03/24/82	Mud rotary
12.	ELM-89-08	147	127	05/14/89	04/01/89	Hollow-stem augers
	*DBM-82-02	154	135	05/14/89	03/20/82	Mud rotary
	*DBN-89-02B	152	107	05/14/89	02/02/89	Dual-wall driven casing
	*ELM-89-09	157	140	05/14/89	03/01/89	Hollow-stem augers
	*ELN-89-02B	181	142	05/14/89	04/18/89	Dual-wall driven casing

Notes:

^{*} Wells were relogged as part of the Quality Assurance/Quality Control Procedures. PVC = polyvinyl chloride

TABLE 7-6 WELLS INCLUDED IN GROUNDWATER SAMPLING FOOGRAM DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITES	NEW WELLS	Existing Wells
Deterrent Burning Ground	DBM-89-01 DBN-89-02A,B DBM-89-03 DBN-89-04A,B DBM-89-05	DBM-82-01 DBM-82-02 DBN-82-01B,C S1122
Subtotal	7	5
Existing Landfill	ELM-89-01 ELN-89-02A,B ELM-89-03 ELN-89-04A,B ELM-89-05 ELN-89-06B ELM-89-07 ELM-89-08 ELM-89-09 ELN-91-07A, B ELM-91-10	ELN-82-01A,B,C ELN-82-02A,B,C ELN-82-03A,B,C ELN-82-04A,B,C S1134 S1135 S1153
Subtotal	14	15
TOTAL WELLS	21	20

Notes:

A,B,C,D - Shallowest to deepest: A indicates shallowest well; D indicates deepest well in a well rest.

TABLE 7-7
CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

			1					NORGANICS	NICS					İ				٥	OPGANICS	90	Ŧ
				Γ	METALS	N.			1	ANIONS	ş	-	l°	OTHER							
SAMPLE LOCATION	PP TAL	™	5	ž	8	5	Ā	2	Ē	F		SO4 HARD	-	ALK TOS	100	NH3N2	NOC BE	BNA	MAN DH	M DNT	
DETERRENT BURNING GROUND	POUNC																				
DBM-82-01	80	ł	۱	1	1	1	1	ı	ſ	00	6 0	•	_ 	8	1	1	æ	•	ı	80	1
DBM-82-02	6 0	1	1	1	1	1	1	}	i	ø	6	89	a	8	-	j	80	6	ł	8	l
DBM-89-01	60	ł	1	ı	I	1	i	}	í	0	80	80		8 8	1	1	80	c	1	8	l
DBM-89-02 A	60	ı	1	ı	1	1	ı	1	1	60	8	80	6		8	I	∞	0	i	8	l
DBM-89-02 B	•	1	ı	i	1	ı	ı	ı	1	60	œ	00	6	8	8	}	∞	•	1	8	l
DBM-89-03	œ	ł	I	ı	ı	ı	1	1	ŧ	8	8	60	6		m	1	•	80	ı	8	1
DBM-89-05	•	ł	ŧ	I	i	1	١	1	1	6	8	8	60	_	-	1	ø	0	1	8	1
DBN-62-01 B	60	1	ı	I	ı	1	١	1	i	8	8	80	80	89	-	ł	0	8	ı	8	1
DBN-82-01 C	∞	ł	ı	١	1	ı	i	ı	i	60	8	60	a	60	-	1	6	00	1	8	1
DBN-89-04 A	0	i	1	I	1	1	١	ı	1	∞	60	60	8	8	-	1	5 0	60	1	8	ı
DBN-89-04 B	6 0	ı	1	I	ı	ı	i	1	ŧ	60	60	60	6 0	8	-	ł	ø	•	ļ	8	ł
\$1122	60	1	ſ	ł	1	ł	1	J	ł	6	80	80	6	8	1	1	60	•	ı	8	ı
EXISTING LANDFILL																					
ELM-89-01	1	6 0	1	1	ı	1	I	ļ	ı	a	8	6	60	8	1	1	60	0	1	1	1
ELM-89-03	1	6 0	ſ	i	ł	Į	ı	ļ	ł	•	60	0	60	æ	1	1	•	60	1	1	ı
ELM-89-05	1	80	í	1	1	1	1	ı	ı	œ	8	60	60	8	1	1	60	80	i	1	1
ELM-89-07	1	80	1	1	1	ł	1	ļ	ł	Ø	a	60	æ	8	1	1	0	6 0		1	ı
ELM-89-08	1	∞	ı	i	I	ł	ł	J	1	Ø	80	œ	_ 	8	-	I	æ	•		1	I
ELM-89-09	1	6 0	1	I	1	i	١	ļ	ŧ	20	•	60	60	8	1	1	80	0		1	1
ELM-91-10	ł	60	i	i	ì	ł	I	1	ł	6 0	6 0	80	80	8	1	ı	œ	∞	1	8 8	ı
ELN-82-01 A	1	∞	ſ	ł	1	1	1	1	1	80	60	60	00	8	1	1	60	6 0		1	1
ELN-82-01 B	İ	6 0	1	1	1	I	ı	ļ	ı	6 0	60	6 0	4 0	8	1	1	6 0	6 0	1	1	Ì
ELN-82-01 C	1	∞	1	1	ı	1	1	1	1	œ	6 0	80	6 0	8	1	ı	œ	6 0	1	1	ı
ELN-82-02 A	1	a	1	١	ì	i	l	ļ	i	œ	60	80		8	1	ł	80	6 0		1	1
ELN-62-02 B	1	80	ſ	I	1	l	ł	ł	1	6 0	60	80	80	8	1	ı	0	6 0		1	ł
ELN-42-02 C	ł	œ	1	1	I	ł	ŧ	1	1	0	8	8	_ 	8		1	æ	6 0		!	1
ELN-62-03 A	ł	8	1	}	ł	1	1	i	ł	~	8	8	8	2	1	ı	8	8		1	l
ELN-82-03 B	ł	80	1	1	l	i	1	ł	ł	6	60	8		8	1	I	6 0	0	1	1	1
ELN-82-03 C	1	00	1	i	1	ł	ŀ	l	ŀ	6	6 0	œ	00	8	1	ł	æ	60		1	1
ELN-82-04 A	1	6 0	ſ	1	ı	ł	1	1	ł	œ	60	∞	 	8	1	•	80	æ	1	1	1
ELN-82-04 B	i	œ	1	ı	i	i	١	1	ł	∞	60	@		8	-	1	60	&		1	1
ELN-82-04 C	1	Q	ŧ	ļ	1	ı	1	ı	ł	m	B	6 0	60	89	1	1	6 0	6 0		1	1
ELN-89-02 A	i	8	1	1	1	}	1	1	ł	~	8	~		8	1	1	~	~		!	1
ELN-89-02 B	1	•	1	ł	i	ł	ł	1	i	60	80	80	-	8	!	1	æ	8	1	1	ı
ELN-89-04 A	t I	8	1	1	1	1	1	1		60	8	8					8	83		-	

CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES. DETERRENT BURNING GROUND/EXISTING LANDFILL

BADGER APMY AMMUNITION PLANT REMEDIAL INVESTIGATION

								INORGANICS	ANICS								Γ			OPIC	8013	ŀ	H
					METALS	S				ANIONS	SNS.			OTHER	55		Γ						
SAMPLE LOCATION	£	PP TAL	ర	ž	8	5	Ţ	£	Ž	E	ರ	804 HARD	\$30	¥	80	20	TDS TOC NHSN2 VOC BNVA	8	Z A	2	¥		
ELN-49-04 B	ŀ	-	ŀ	ı	ŀ	ŀ	ŀ	ŀ	1	-	6	-	-	-	-	ŀ	1	-	-	þ	1	1	1
ELN-89-06 B	ł	40	I	ı	ı	ł	ı	1	1	∞	•	•	c	0	∞	ı	1	•	40	I	1	ı	1
ELN-01-07 A	ł	•	ŀ	ŧ	1	1	1	1	1	60	•	80	6	60	ø	ı	1	•	80	I	40	•	ļ
ELN-01-07 B	I	•	I	1	ı	1	ı	1	ı	∞	•	20	60	6 0	∞	ı	i	∞	6 0	ı	•	•	ı
81134	I	•	ı	ł	ı	I	i	١	1	∞	80	6	80	Ø	ø	1	1	•	6	İ	ı	ı	1
51135	1	•	ı	i	ı	ı	ı	i	ı	60	60	6 0	8	80	۵	1	I	•	•	I	ı	ı	ı
81183	1	∞	1	t	1	1	1	ı	ı	∞	•	6 0	6	60	•	1	I	∞	•	ļ	!	ı	1
TOTALS	ž	24 56	0	0	0	0	0	•	0	2	2	2	2	2	2	•	08 0 0 08 08 08 08	2	8	•	8	8	•

NOTES:

BN/A = base-neutral and acid-extractable organics by GCMS

DNT = 2,4- and 2,8-dinkrotoluene by HPLC

GCAMS = Gas Chromatography/Mass Spectrometry

HPLC = High Performance Liquid Chromatrography

NAM = nitrosamines by GC

PP = Priority Poliutant Metals (13) (AG, AS, BE, CD, CR, CU.) ; NI, SB, SE, TL, ZN)
TAL = Toxic Analye List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, MI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCMS

B = Analyzed in both Rounds (One and Two).

1 = Analyzed in Round One only.

2 = Analyzed in Round Two only.

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TABLE 7-8 ELEVATION OF GLACIOLACUSTRINE UNIT DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	GROUNDWATER ELEVATION* FT. MSL	SCREEN ELEVATION FT. MSL	LACUSTRINE SILT AND CLAY ELEVATION AND COMMENTS FT. MSL
DBM-89-01	780.14	788.6 to 768.6	767 to 775, silt with clay, some fine sand
DBN-89-02A	777.04	785.3 to 765.3	780 to 772, stratified silt, clay and
DBN-89-02B	776.94	739.8 to 734.8	sand
DBM-89-03	777.00	783.4 to 763.4	No silt and clay, silty sand above gravel at elevation 790
DBN-89-04A	780.25	782.5 to 762.5	752 to 748, silt and clay above
DBN-89-04B	776.79	735.9 to 730.9	sand and gravel
DBM-89-05	783.89	790.9 to 770.9	773, clay at bottom of boring
DBM-82-01	777.08	763.7 to 743.7	777 to 754, silty clay above fine to coarse sand
DBM-82-02	780.56	782.3 to 762.3	783 to 763, silty clay and fine sand
S1122	777.12	780.6 to 760.6	778 to 767, clayey silt with some
DBN-82-01B	777.06	748.2 to 746.2	fine sand and gravel
DBN-82-01C	777.13	739.7 to 737.7	
ELN-91-07A	774.88	779.5 to 769.5	No silt and clay, only gravelly
ELN-91-07B	776.90	758.9 to 748.9	soils at depth
ELM-91-10	777.11	781.8 to 766.8	Below 766.2 clayey silt with fine sand at bottom of boring
ELM-89-01	778.05	775.0 to 755.0	760 to 765, clayey silt above sand and gravel
ELN-89-02A	776.88	780.4 to 760.4	779 to 769, stratified clayey silt
ELN-89-02B	776.24	744.5 to 739.5	with fine sand
ELM-89-03	777.00	784.0 to 764.0	No silt and clay, fine-medium sand lenses at 754 to 744
ELN-89-04A	776.86	782.1 to 762.1	No silt and clay, fine sand above
ELN-89-04B	776.06	730.8 to 725.8	gravel at 745
ELM-89-05	777.47	785.2 to 765.2	No silt and clay, bottom of boring at 758
ELN-89-06B	776.73	729.1 to 724.1	No silt and clay, fine sand over
S1153	777.07		gravel at 776

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TABLE 7-8 **ELEVATION OF GLACIOLACUSTRINE UNIT -DETERRENT BURNING GROUND/EXISTING LANDFILL**

REMEDIAL INVESTIGATION **BADGER ARMY AMMUNITION PLANT**

WELL DESIGNATION	GROUNDWATER ELEVATION* FT. MSL	SCREEN ELEVATION FT. MSL	LACUSTRINE SILT AND CLAY ELEVATION AND COMMENTS FT. MSL
ELM-89-07	776.22	783.4 to 763.4	No sitt and clay, only gravelly soils at depth
ELM-89-08	776.97	778.0 to 758.0	No silt and clay
ELM-89-09	779.21	784.6 to 764.6	No silt and clay, bottom of boring at 760
ELN-82-01A	777.82	780.5 to 770.5	773 to 771, clayey silt at bottom
ELN-82-01B	777.76	760.6 to 758.6	of boring
ELN-82-01C	777.44	751.0 to 749.0	
ELN-82-02A	777.39	781.8 to 771.8	749 to 751, silty clay observed in
ELN-82-02B	777.43	764.7 to 762.7	bottom of Deep "C" well
ELN-82-02C	777.41	753.1 to 751.1	
ELN-82-03A	777.28	780.2 to 770.2	772 to 770, silty clay observed at
ELN-82-03B	777.11	761.1 to 759.1	bottom of boring
ELN-82-03C	777.11	751.0 to 749.0	
ELN-82-04A	778.09	780.4 to 770.4	Silt and clay at elevation 771 in
ELN-82-04B	777.83	758.5 to 756.5	Warzyn cross section (Warzyn, 1982)
ELN-82-04C	777.27	750.2 to 748.2	1.002,

^{*} Groundwater elevations measured on December 15, 1991 FT MSL = feet, mean sea level

TABLE 7-9 VERTICAL GROUNDWATER GRADIENTS -DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Well Nest	WATER LEVEL DIFFERENCE (FT.)/SCREEN SEPARATION (FT.) ⁴	VERTICAL GRADIENT AND DIRECTION (FT/FT)	COMMENT (WATER LEVEL DIFFERENCE)
DBN-89-04A and B1	3.46/40	0.09d ²	Substantial
DBN-89-02A and B	0.10/37	0.003d ³	Small
S1122 and DBN-82-01B	0.06/22	0.003d	Small
DBN-82-01B and C	0.07/10	0.007u	Small
ELN-91-07A and B	0.02/23	0.000 9 u	Insignificant
ELN-89-02A and B1	0.64/27	0.02d	
ELN-89-04A and B	0.80/44	0.02d	
ELN-89-06B and \$1153	0.34/49	0.008d	
ELN-82-01A and B	0.06/16	0.004d	Small
ELN-82-01B and C1	0.32/9	0.04d	
ELN-82-02A and B	0.04/14	0.003u	Insignificant5
ELN-82-02B and C	0.02/11	0.002d	Insignificant
ELN-82-03A and B ¹	0.17/15	0.01d	Small
ELN-82-03B and C	0.00/10	0.00	No Difference
ELN-82-04A and B	0.26/18	0.01d	
ELN-82-04B and C1	0.56/8	0.07d	

Notes:

Water level differences were concluded to be insignificant at less than 0.05 ft.

Water level differences were concluded to be small at less than 0.2 ft.

¹ Indicates well nest clearly screened across fine-grained lacustrine soils

d = downward gradient u = upward gradient

⁴ All measurements based on December 15, 1991 water level measurements.

⁵ Both wells are above the glaciolacustrine unit

TABLE 7-10 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
DBM-89-01	1.5	3x10 ⁻²	Fine sand (SP) over silt and clay (ML)
DBN-89-02A	1.4	8x10 ⁻²	Silt and clay (CL-ML) over gravel (GP)
DBN-89-02B	2.5	1x10 ⁻¹	Gravel with sand (GP)
DBM-89-03	0.9	1x10 ⁻¹	Gravel with sand (GW-GP
DBN-89-04A	2.0	3x10 ⁻²	Fine to medium sand with gravel (SP)
DBN-89-04B	2.2	5x10 ⁻²	Gravel with sand (GP)
DBM-89-05	3.4	6x10 ⁻³	Fine to medium sand (SP
DBM-82-01	2.9	7x10 ⁻³	Silty clay and fine to coarse sand (CL-SP)
ELN-91-07A	1.8	5x10 ⁻³	Medium coarse sand with gravel (SW)
ELN-91-07B	6.5	2x10 ⁻²	Coarse to fine sand (SW)
ELM-91-10	1.5	2x10 ⁻²	Medium fine sand (SP)
ELM-89-01	3.6	8x10 ⁻³	Medium sand and sitty sand (SP-SM)
ELN-89-04A	2.4	4x10 ⁻²	Find sand with little grave (SP)
ELN-89-04B	7.0	1x10 ⁻¹	Gravel with little sand (GF
ELM-89-05	2.4	1x10 ⁻²	Sand with gravel (SP-SW)
ELM-89-06B	8.0	5x10 ⁻²	Well graded gravel over fine sand (GW-SP)
ELM-89-07	1.2	1x10 ⁻¹	Medium to fine gravel wit some coarse sand (GP)
ELM-89-08	2.0	4x10 ⁻²	Sand with gravel (SP-GB)

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TABLE 7-10 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
ELM-89-09	2.3	3x10 ⁻²	Sand (SP)
ELN-82-03C	5.1	6x10 ⁻³	Coarse to fine sand (SP)
ELN-82-04A	1.1	3x10 ⁻⁴	Medium fine sand (SM)
S1153	2.2	5x10 ⁻³	Medium fine sand, some gravel (SW-SM)

Notes:

Hydraulic Conductivity Tests completed during March and November, 1989, and November and December 1991.

Field data and calculations are presented in Appendix I.

Values for hydrautic conductivities represent an averaged value of multiple tests performed on each well.

Water level recovery at these wells impacted by inertial effects, resulting in water level recovery above static water levels. Hydraulic conductivity measurements may be greater than the calculated values at these wells.

cm/sec = centimeters per second

TABLE 7-11 HORIZONTAL GROUNDWATER GRADIENTS DETERRENT BURNING GROUND/EXISTING LANDFILL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL NEST	HORIZONTAL GRADIENT ¹ AND DIRECTION (FT/FT)	COMMENT
DBM-82-02 ELM-89-09	0.004	Above lacustrine silt; northeasterly flow vector
DBM-89-05 ELM-89-01	0.005	Above lacustrine silt; northeasterly flow vector
DBN-89-04A ELN-82-04A	0.003	Above lacustrine silt; northeasterly flow vector
ELM-89-09 ELN-82-03A	0.002	Above lacustrine silt; easterly flow vector
ELM-89-08 ELN-91-07B	0.00005	Below lacustrine silt; east-southeasterly flow vector
ELN-82-03C ELN-89-06B	0.0008	Below lacustrine sitt; east-southeasterly flow vector

Notes:

ft/ft = feet per foot

¹ All gradients based on December 15, 1991 water level measurement.

TABLE 7-12
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATADETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01
Sample Type:	¥	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
SLIND		000	oga	990	990	990	ngg	990	990	990	nge
DATE SAMPLED	PLED	10/15/91	10/12/91	10/13/01	10/15/91	10/12/91	10/13/91	10/15/91	10/15/91	10/15/91	10/17/01
DEPTH		2.000	4.000	900.9	8.000	10.000	15.000	20,000	25.000	30,000	42.000
VOC.	13DMB	ı	1	1	•	ŀ	0.290	0.584	1	1	ı
	C6H6	3.950	0.143	5.250	1.060	0.341	0.371	0.170	76.600	1	,
	CH2CL2	ı	•	,	1	•	•		1	1	1
	MEC6HS	0.136	1	ı	1	ı	0.273	0.194	2.070	ı	•
-Jones	JAMAB										
	TACAC		1000		1000	90001	1 000	1 000			
	INOS	200.000	300000	3/000.000	30000.000	10000.000	4.00.000	3300.000	12000.000	8.400 (3.00	12.100 12.100
	I NICOZ	0.1.2	78.900	15 000:70	95.000 G	5 000.7e	9.000	240.000	15 000.70	4.670	9
	LNE	•		ı	4.830	900.9	0 . 11 0	90.9	14.300	•	•
	BZEHP	1.350	1	•	1	•	1	•		•	•
	DEP	ı	•	1	ı	ı	25.900	9.530	•	1	•
	DNBP	•	1	46.500	1	62.000 GT	62.000 GT	62.000 GT	42.100	2.290	1.840
	FANT	1	•	1	ı	,	•			1	•
	NNDMEA	•	•		1	•	0.018		•	•	1
	NNDPA	4.700	98.000	127.000	730.000	2200.000	2400.000	1800.000	\$200.000	1.740	1.040
	PHANTR	,		•	1	•	•	•	1	ı	•
	PYR	ı	•	1	ı	•	ı	,	•	•	
Metals	AS			3.010				•	-		
	2	3.640	2.440	5.900	2.410	2.930	1.910	1.980	2.240	Q;•.T	3.940
	23	12.400	ı	8.180	98.9	6.010	1	1	5.820	4.570	4.060
_	Z	3.390	•	4.510	3.980	4.430	,	•	ı	1	3.190
	84	13.300	4.970	20.200	2.610	7.490	1.480	2.380	4.890	6.180	2.840
	SE	•	ı	ı	1	ı	ı	•	•	•	•
	Z	16.500	8.860	18.200	6.350	6.400	2.720	3.610	9.800	4.780	9.370
Anions	TIN	060'9	13.200	15.300	12.900	18.700	2.610	2.880	3.500	1.050	1.410
	804	•	1	1	-	ł	1	1	1	1	1

TABLE 7-12
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATADETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sie ID:		DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-01	DBB-91-03	DBB-91-02	DBB-91-02	DBB-91-07
imple Type:		BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
UNITS		000	000	990	000	000	250	990	990	990	990
DATE SAMPLED:	Ä	16/31/01	10/15/91	10/13/91	10/12/91	10/15/91	10/12/91	10/15/91	10/15/91	10/15/91	10/15/91
DEPTH		44.000	52,000	72.000	92.000	112.000	117.000	4.000	000'9	8.000	10.000
VOCs	13DMB	ı	1	ı	•	ı	ı	1		ı	•
	C6H6	1	ı	,	ı	•	1	095	20.00	•	1
	CHUCHU	•	,		•	•	. •	} '		,	ı
	MECGHS	1 1	. 1	۱ ۱		, ,	1 1	1 1		۱ ۱	1 1
	TXYLEN										
SVOC	2MNAP				-		1		1		
	24DNT	1	ı	ı	•	ı	,	1200.000	2500.000	16.800	1
	26DNT	1.760	1.480	,	ı	•	•	6.200 GT	230,000	6.200 GT	1
	NS LNS	1	•	ı	•	•	ı	•	1	ı	•
	BZEHP	•	1	ı	1.460	•	•	1.450		•	1
	DEP	ı		,	•			1	•	1	•
	DNBP	ı	ı	1	ı	1	•	6.200 GT	6.200 GT	6.200 GT	•
	FANT	1		•	•	1	•	•	•		1
Z	INDMEA	ı	ı	ı	,		•	1	0.015	•	•
~	NNDPA	0.179	0.121	0.326	,	•	•	390.000	460.000	2.200 L	0.193
-	PHANTR	ı	•	•		•	ı	ı	1	1	
	PYR	•	•	•	•	•	•	•	1	•	1
Metals	AS	•			,	1		4.070	3.390	7.880	
	ర	3.950	3.660	2.960	2.090	2.040	2.820	13.200	11.700	8.410	4.940
	5	8.040	4.650	4.040	•	•	•	15.900	14.200	12.800	7.940
	Z	3.680	1	1	,	ŧ	ı	10.200	6.820	4.910	3.700
	PB	1.720	7.460	1.750	1.370	1.200	1.800	10.000	8.000	9.100	3,060
	SE	•	•	•	•	•	•	ı	•	•	,
	ZN	7.070	4.220	3.830	,	4.090	4.280	26.700	20.600	9.780	8.910
Anions	EX	1	1	.1	2.050	•		2.270	1.600	3.430	2.170
	\$0X	1	1	A 135	12 700	1	•	ļ	ı		9

TABLE 7-12
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATADETERRENT BURNING GROUND/EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

	DBB-91-02	20171000	70-16-990	20-14-000	70-16-997	70 - X - GGG	70-14-990	70-14-000	70-14-990	70 - 16 - 99C
Sample Type:	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
	000	000	990	000	000	000	990	995	992	990
DATE SAMPLED:	10/12/91	10/12/91	10/15/91	16/17/01	10/12/91	10/15/91	10/13/91	10/15/91	10/15/91	10/13/91
	14,000	16,000	20.000	27.000	42.000	62.000	72.000	92,000	112,000	122,000
13DMB	ı	ı	i	1	•	1	1	1	1	1
C6H6	•	1	•	1	•	i	1	1	1	1
CH2CL2	•	1	ı	,	ı	•	•	•	ı	1
MEC6HS TXYLEN	ı	ı	•	ι	•	1	1	i	ı	ı
ZMNAP	-		1	•	1				1	
24DNT	1	,	1	3.650	ı	ı	,	,	•	
26DNT	,	1	ı	0.558	ı	•	1	1	ı	1
TNE	ı	•	1	•	•	ı	•		i	•
BZEHP	1	ı	1.620	ı	1	ı	ı	1	•	ı
DEP	1	,	1	ı	•	•	•	•	•	1
DNBP		ı	1	2.980	ı	1	ı		•	•
FANT	•	,	1	1	1	,	•	•	1	•
NNDMEA	1	•	,	ı	,	•	1	ı	1	1
NNDPA	•	ı	0.093	ı	0.168	ı	0.061	1	•	0.098
PHANTR	1	ı	1	,	•	ı	•	ı	•	ı
PYR	•	ı	ı	ı	ı	•	1	1	•	1
SA		•	1	•	1	,	1	-		1
5	2.900	1.580	2.730	2.960	3.830	2.510	2.150	3.050	3.680	3.240
S	1	•	4.380	5.330	9.590	3.200	ı	•	3.550	. 1
Z	1	,	1	ı	3.680	ł	1	ı		1
2	0.699	0.874	1.500	1.610	1.810	1.810	0.946	0.737	1.220	0.987
SE	•	•	ı	•	ı	•	•	•	ı	ı
NZ	2.590	1	5.640	9.780	6.390	4.260	•	3.000	7.590	4.310
ᅜ	\$.270	3.510	3.320	2.210	1.800	1.470	1.780	2.170	1.970	2.580
205	•	1	1	6.350	1	•	28.600		8.480	75.700

Notes and flagging codes are presented at the end of this table.

TABLE 7-12
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATADETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: UNITS: DA IF SAMPLED:		DBB-91-03	DBB-91-03	DBB-91-03	DBB-91-03	DBB-91-03	DBB-91-03	DEB-91-03	DBB-91-03	DPR - 21-03
NITS:	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BURE
A IF SAMPLED:	990	000	000	990	990	ngg	990	99 <u>0</u>	990	000
	10/16/91	10/16/91	10/16/91	10/16/91	10/16/91	10/16/91	10/16/91	10/16/91	10/16/91	16/10/
DEPITE	4.000	6.000	12.000	14.000	16.000	18.000	20.000	22,000	27.000	42.000
VOCe 13DMB	-									
C6H6	0.001 S	0.002 S	;	•	ı	•	•	ł	•	•
CHICK		0.002 S	ì	0.003 S	0.019 S	0.011 S	ł	0.008 S	0.003 S	1
MECOH	1	ı	•	1	•	•	1	1	1	٠
	i 7	•	0.001 S	0.002 S	1	1	•	•	•	ı
SVOCe 2MNAP				0600	-	•	•		-	
	•	2900.000	790.000	900.000	2400.000	13.700	6.210	1.630	•	i
Z6DNT	8.700	1400.000	1000.000	6.200 GT	6.200 GT	32.800	0.589	1.460	1	ı
TNE		1.520	4.970	6.200 GT	2.190	1		,	•	1
BZEHP	1.530	1.160	4.350	5.790	1.600	0.850	ı	2.090	1	1
DEP		•	ı	1	1	ı	1	1	•	•
DNB	3.250	2.990	6.200 GT	6.200 GT	6.200 GT	2.170	ı	1	1	9 :
FANT		1	ı	ı	•		1	ſ	•	,
NNDME		1	ı	1	1	ı	•	ı		,
NNDPA		24.000	150.000	820.000	280.000	10.500	•	1.140	•	,
PHANT		•		ı	ı	ı	1	1	1	1
	0.144	1	1	ı	•	•	•	1	•	1
Metals AS	1				•		1	1	ı	
5	7.950	7.320	7.410	2.820	2.150	3.870	2.490	2.270	3.060	0907
CG	23.100	12.300	8.800	3.780	1	3.980	3.300	3.290	4.050	0213
Z	5.280	3,340	4.940	1	ı	,	•	ſ	1	
2	7.000	3.820	5.390	1.150	1.600	2.430	1.680	1.740	2.220	1.400
SE	•	1	•	t	1	1	2.970	1	•	1
ZN	13.300	16.900	10.400	4.760	3.860	5.410	4.990	2700	5,440	6.360
Asioss NIT	2.510	8.020	8.910	13,000	4.220	5.820	1.610	1.880	1.610	1 700
204	ı	•	•	i	,	•	240.000	150.000	96.400	29.900

TABLE 7–12
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATADETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		DBB - 91 - 03	DBB-91-03	DBB - 91 - 03	DBB-91-03
Nample Type:		BORE	BORE	BORE	BORE
UNITS		090	000	990	990
DATE SAMPLED:		10/16/91	16/91/01	16/91/01	10/16/91
DEPTH:		62.000	82.000	102.000	122,000
VOCs	13DMB				
	C6H6	ı	1	ſ	1
	CH2CL2		1	ı	1
	MEC6H5	1	t	1	1
	TXYLEN	1	1	•	•
SVOC	2MNAP			1	1
	24DNT	1		•	•
	26DNT	1	•	1	1
	JNT	1	1	•	1
	B2EHP	•		•	ı
	DEP	1	ı	ı	•
	DNBP	ı	•	1	•
	FANT		1	ŀ	ı
	NNDMEA	ı	•	ı	ı
	NNDPA	•	1	,	ı
	PHANTR	•	•	1	
	PYR	•	•	,	•
Metals	AS				•
	క	3.230	3.880	12.100	3.820
	CO	3.900	4.670	0.540	•
	Z		2.900	3.730	1
	84	1.330	1.230	4.220	0.986
	SE	,	1	t	ı
	ZN	2.630	6.500	106.000	0.640
Asioss	FIX	2.290	055"1	1.840	2.130
	, ,	20001			200

TABLE 7-12
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATADETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range but within acceptable limits
			M	*	¥	H	Ħ	Ħ	Ħ	Ħ	H			11
Ξ	(3)	ner	VOC	SVOCs	Blank cell	•	G	6	g	۵.	œ	s	Н	×

USATHAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results.

TABLE 7-13 SUMMARY OF TCLP METALS DATA FOR SUBSURFACE SOIL DETERRENT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		TCLP L	EACHATE CO	NCENTRATIO	N (µg/£)	
SAMPLE LOCATION	DEPTH	CD	CR	PB	HG	Notes
TCLP RL1		1,000	5,000	5,000	200	
Minimum Reporting Value		6.8	16.8	43.4	0.1	
DBB-91-01	2	LT	LT	LT	0.9	TCLP RL not exceeded
DBB-91-01	4	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	6	LT	LT	LT	0.2	TCLP RL not exceeded
DBB-91-01	8	LT	LT	LT	0.3	TCLP RL not exceeded
DBB-91-01	10	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	15	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	20	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	25	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	30	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	42	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	44	LT	LT	LT	ĹŤ	TCLP RL not exceeded
DBB-91-01	52	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	72	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	92	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	112	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-01	117	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	4	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	6	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	8	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	10	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	14	LT	LT	LT	0.8	TCLP RL not exceeded
DBB-91-02	16	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	20	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	27	LT	LT	LT	0.2	TCLP RL not exceeded

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TABLE 7-13
SUMMARY OF TCLP METALS DATA FOR SUBSURFACE SOIL DETERRENT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		TCLP L	EACHATE CO	NCENTRATIC	N (µg/l)	
SAMPLE LOCATION	D EPTH	CD	CR	РВ	HG	Notes
DBB-91-02	42	LT	LT	LT	0.2	TCLP RL not exceeded
DBB-91-02	62	LT	LT	LT	8.0	TCLP RL not exceeded
DBB-91-02	72	LT	21.8	LT	0.3	TCLP RL not exceeded
DBB-91-02	92	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	112	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-02	122	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	4	LT	35.9	LT	LT	TCLP RL not exceeded
DBB-91-03	8	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	12	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	14	LT	LT	LT	ŁT	TCLP RL not exceeded
DBB-91-03	16	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	18	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	20	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	22	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	27	7.9	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	42	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	62	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	82	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	102	LT	LT	LT	LT	TCLP RL not exceeded
DBB-91-03	122	LT	LT	LT	LT	TCLP RL not exceeded

Notes:

¹ TCLP Regulatory Levels (RLs) exist for the following metals: AS, BA, CD, CR, SE, PB, HG, and AG. However, these results were reported only for CD, CR, PB, and HG. (List of USATHAMA Chemical Codes for definitions of chemical abbreviations).

TABLE 7-14
SUMMARY OF GROUNDWATER CHEMICAL DATA DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		D	1M-82-	01		DBM-8	2-02	DBM-	19-01	DBM-	89-03	DBM-	89-05
Sample Type: UNITS:	ÿ		WELL			WELL	-1 _\	WELL	3-	WELL	1	WELL	1 ;
DATE SAMPLED: ROUND:	APLED:	12/10/91 ONE		04,11/92 TWO		12/09/91 ONE	04/11/92 TWO	12/10/91 ONE	04/13/92 TWO	12/10/91 ONE	04/11/92 TWO	12/08/91 ONE	04/11/92 TWO
voc.	111TCE	1		ı		8.34	12.1	,	1	,	,	1	,
	13DMB	i		ı		,	;	1	1	•	•	4.300 S	
	CH2CL2	4.31	۵.	7.75	8	67.5	7.45 B	4.51 P	1	S.1 P	7.94 B	5.39	•
	CHCL3	ı		1		ı	,	,	1	•	1	•	1
	MEC6HS			1		1	J	1	•	,	1	S.460 P	ŧ
SVOC	2BUXEL							S 5.5					
	2E1HXL												
	26DNT			1.29		ì	ı		1	ı	ŀ	•	•
	BZEHP	27.1	۵.	ı		ı	22		•			,	98.7
	NNDPA			14.5		1	1.02	1	1	1	1	1	,
Metals	CD	ı		1		-	,	ı	1		1		
	S S	6.74		ŧ		86.6	J	8.88	•	4.98	ı	•	ı
	D)	1		١		69.9	ı	ı	5.37	1	•	ı	•
	ZN	ı		1		,	ŀ	1	1	t	8 0 2	,	•
Anions	L Z	16000		2600		00++	2300	3200	2200	9049	2300	0099	4200
	ij	001 <i>\$</i> :		\$200		29000 P	37000	14000	18000	20095	7300	3600	4600
	\$0 1	30000		32000		450000	630000	27000	27000	2,000	31000	31000	32000
Indicator	ALK	311000		289000		\$14000	477000	227000	230000	266000	256000	280000	250000
parameter	HARD	278000		298000		818000	000896	248000	258000	254000	296000	248000	292000
	TDS	328000		300000		1090000	1310000	268000	244000	281000	272000	313000	297000
	pH(1)	7.4		7.2		7.1	7.0	7.7	8.0	7.6	7.4	1.1	7.5
	Sp.Cond.(2)	\$10		764		1072	1304	417	77	4 22	472	625	488

TABLE 7–14
SUMMARY OF GROUNDWATER CHEMICAL DATA –
DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name Name	Site ID:		DB	DBN-82-01B	118		DBN-	82-01C		DBN	39-02A	0	-89-X	028	DBN-	99-04A	
111TCE	Sample Type	. :		WELL			₹Þ	פּה		¥ 5	금능		WELL		Š	ಪ್ರಕ	
111TCE	DATE SAM	PLED:					12/09/91 ONE	04/12/9 TWO	~	12/12/91 ONE	04/13/92 TWO	12/12/91 ONE		04/13/92 TWO	12/07/91 ONE	04/10/92 TWO	
1111 12		111200					1					,			3.730 P	907	-
CH2CL2 5.2 P 5.88 B 5.29 5.78 B 4.8 P 6.06 B 4.51 P 5.29 B 5.100 P CH2CL2 5.2 P 5.88 B 5.29 5.78 B 4.8 P 6.06 B 4.51 P 5.29 B 5.100 P CH2CL3 5.2 P 5.88 B 5.29 5.78 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P - 0.614 P		בו בו	ł		,			1								!	
CH2CL2 5.2 P 5.88 B 5.29 5.78 B 4.8 P 6.08 B 4.51 P 5.29 B 5.100 P MECHL3 -		13DMB	1		ſ		3.4 S	•		•	1	ł		•		1	
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272 273 462 514 343 374 572		5110			17		7.8	7.5		1.7	7.6	7.8		7.5	7.3	7.2	
		Sa Cond (2)			17,		316	257		462	514	343		374	<i>\$12</i>	845	

TABLE 7-14
SUMMARY OF GROUNDWATER CHEMICAL DATA DETERRENT BURNING GROUND/ EXISTING LANDFILL.
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		DBN	85-04B		77
Sample Type: UNITS:	ü	Š	WELL	WE	WELL UGL
DATE SAMPLED: ROUND:	IPLED:	12/07/91 ONE	04/10/92 TWO	12/07/91 ONE	04/12/92 TWO
.000	304111				1
3		ı			
	13DMB	1	1	ı	1
	CH2CL2	5.29	7.75 B	\$.29	ı
	CHCL3	ı	ı	ı	•
	MEC6115	ı	1	1	1
SVOC	2BUXEL				
	2E IHXL	S 05.			
	26DNT	ı	ı	1	ı
	BZEHP	87.6	27 P	,	28 P
	NNDPA	ı	•	1	,
Metals	9	1	1	•	,
	క	5.6	•	7.81	•
	CC	•	ı	ı	5.43
	ZN	ı	•	ı	•
Anions	LIN	2600	9200	3300	1300
	ರ	4800	0069	9400	6200
	204	25000	23000	28000	26000
Indicator	ALK	222000	250000	198000	336000
perameter	HARD	280000	304000	326000	368000
	SŒ.	209000	331000	359000	351000
	pH(1)	7.6	7.4	7.1	7.1
•	Contract (2)		303	£33	700

TABLE 7-14
SUMMARY OF GROUNDWATER CHEMICAL DATA -DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:			ELM-69-01	_		20100	J E L	20-46	Link	-		92-29
Sample Type:	ü		WELL		IW.	WELL	WELL	1 =	WELL	1,	WELL	ゴ
DAIT: SAMPLED: ROUND:	IPLED:	12/04/91 ONE		04/12/92 TWO	12/08/91 ONE	04/10/92 TWO	12/08/91 ONE	04/10/92 TWO	12/09/91 ONE	04/13/92 TWO	12/09/91 ONE	04/13/92 TWO
VOCs	111TCE	8.	ŝ.	95	1	ı	ı					
	112TCE	•		ı	1	•	,	ı	0.462 P	1	,	ı
	12DMB	ı		•	1	•	•	,	1	ı	•	ı
	13DMB	1		ı	1	1	1	,	S 6.5	•	ı	1
	ACET	•		ı	ı	ı	1	ı	1	ı	1	ı
	C6H6	ı			•	ı	ı	,	1	•	•	1
	CH2CL2	4.41	۵.	5.78 B	5 .0 P	7.25 B	5.49	7.84 8	a. •0:7	5.88 B	S. 1. 7	6.86 B
	CH3CL	ı		ı	1	•	ı	,	•	,	•	1
	CHCL3	•		t	ı	•	ı	,	1	ı	•	ı
	MEC6HS	ŧ		•	•	•	4.72 P	,	5.28 P	•	1	1
	MEK	ı		i	1	•	1	1	ı	•	1	1
	TCLEE	•		1	1		•	,	•	•	ı	ı
	TRCLE	1		1	1	1.8	0.382 P	1	1	•	1	1
SVOCE	JEIHXL			1	-			,				
	1MP	ı		•	,	1		J	ŧ	1	1	ı
	BZEHP	41.4	۵.	1	1	06	•	J	•	1	**	1
	PHENOL	ı		ı	•	•	1	1		ı	1	ı
	TRIMBZ			1				,	× ×	1		
Metals	YC	ı		1	1	•	•	,	ı	,	•	•
	BA	0.8 V.		5.	\$	30.6	32.2	32.2	30.4	31.3	28.2	56.9
	8	,	!	1	1	1	1	1	1	1		1
	5	0000	5	180000	83000	7,000	8,000	81000	70000	72000	000	67000
	ž ;	19.5		ı	8.67	•	13.8	1	7.04	ı !	5.81	ı
	<u>.</u>	ı		ı	۱ ;		. ;	,	1 }	. ;	. ;	
	FE :	<u>9</u>		1	31.9	ı	42.3	1	39.0	ı	37.0	1
	E C	, ;	,	1	. }		1	4 54	1	1 }	1	•
	⊻ ;	1730	-	1 0551	1 200	T 0272	992 T	7.260 T	1320 T	1 065 T	1100 T	1260 1
	٠ ا	0000	5	10000	44000	38000	00005	44000	39000	40000	32000	34000
	Z :	ı		F	ł	1 600		1 0000	ı	1 55	ı	1 3
	<u> </u>	ı		2000	t	noc!	•	1 0001	ı	1 00071		
	- G			1 :			, 78	• 1	1 1	1 1	. (
	E C	•		4	ı	•		- 1	1	۱ ۱	· •	
	\ } >	ŧ		15.6	ŧ	•	,	ı	,	9.85	•	7.22
	NZ	1		ı	t	ı	,	,	ı	•	•	١,
Asions	TIN	1800		906.7	2900	1300	0055	2600	3000	1700	9000	9000
	5	21000		20000	8200	7700	1,5000	15000	0009	2600	0099	2600
	SO4	340000		330000	41000	4400	26000	2,000	39000	0009+	28000	29000
Indicator	ALK	424000		488000	316000	288000	354000	357000	286000	298000	249000	246000
parameter	HARD	730000		754000	2,0000	346000	348000	416000	316000	336000	256000	296000
_	TDS	1010000		928000	380000	359000	348000	413000	328000	352000	283000	311000
	pH (1)	7.5		6.9	7.4	7.3	7.4	7.5	7.5	7.8	7.6	7.9
	(C) T ()	=		13.4	713	yyy	455	613	673	633	•••	1001

TABLE 7– 14
SUMMARY OF GROUNDWATER CHEMICAL DATA –
DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

2110			AD ACCIDED	•		3				VI.2.30	֭֭֭֭֭֭֭֭֭֭֭֡֝֝֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜֜	252-301			וכונ
Sample Type:	ü		WELL	,			WELL		WE	WELL	⇒ *	WELL		WELL	-
3112	1	1							5	3	-	5			
DATE SAMPLED:	PLED:	12/10/91 ONE		04/09/92 TWO		12/08/91 ONE	9	04/13/92 TWO	11/25/91 ONE	04/09/92 TWO	11/25/91 ONE	04/09/92 TWO		11/25/91 ONE	04/09/92 TWO
VOC.	HTCE	3.07	<u>-</u>	7.68		1		,	ı	ı	•	1		ı	
	112TCE	0.365	۵.	1		•		1	1	1	ı	1		1	1
	12DMB	•		1		•		•	ı	•	,	1			ı
	13DMB	•		1		ı		,	1	•	1	1		1	ı
	ACET	•		ı		•		1	•	1	ı	1		1	ı
	C6H6	ı				ı		•	•		1	ı		i	•
	CH2CL2	7	<u>م</u>		∞	5.29		4.31 P	5.59	5.98 B	1	98.9	*	.61 P	6.47 B
	CH3CL	ı				ı			t	•	1	ŧ			ŧ
	CHCL3	1				1		1	1	1	ŧ	1		ł	1
	MEC6HS	1				ì		1	ı	ì	ı	•		1	ı
	MEK	•		1		ı			1	ı	ł	1		•	1
	TCLEE	1		1		•			ı	1	1	•		1	ı
	TACLE	1		ı		ı		1	•	•	,	1		•	,
SVOCs	2E1HXL					1				•				1	
	4MP	1		1		ł		1	,	1	80.5	1			ı
	BZEHP	4.6	۵.	ı		ı		i	ı	•	40.3 P	43.8		ı	1
	PHENOL	1		ı		ı		1	1		12.1	1		1	ŧ
	TRIMBZ			1						ı					1
Metals	٧C			,		ı		0.517	1	•		ı			
	BA	3		70.0		76		81	15.2	15.4	41.7 X	X	7	25.5	ೱ
	BE	ı		0.362		ı		1	•	t	1	1		1	•
	٧	0000	5	130000		100000	GTX 2	24000000	0000039	0000009	6200000	\$20000		\$700000	0000009
	ర	23		1		15.6		1	10.8	1	8.48	1	•	9.49	1
	2	ı		5.33		6.41		3.2	i	8.87	4.7	4.71		ı	,
	표	51.7		•		25.8		0.69	ı	•	488	1		1	ı
	HG	1		ı		,		,	1	1	1	ı		ı	1
	¥	906	۰	10000	-	2530	_	2380 T	7 0.696	1480 T	2610 T	F 2340	_	890.0 T	1410 T
	MG	\$0000	GT GT	120000		0000		1000000	3700000	3200000	3,500000	3100000		00000	3000000
	Z	•		ı		73.3		28.3	ı	ı	127	47.4		1	ı
	٧	24000	ı	25000	-	19000	<u></u>	24000 T	3010 T	F 00H9	7 2890	0098	-	P+0 T	2 0009
	Z	1		1		ı		1		1	69.6	9.95 2.95		1	1
	PB	1		•		ı		1	ı	•	1	1		1	1
	SE	•		ı		ı		1	1	1	•	•		1	
	>	•		ı		ı		19.1	9 9. -	1	4.82	•	•	=	1
	Z	ı		1		1		55.6	1	077	900	•	v,	56.3	•
Anions	L N	9300		7200		1900		055	1200	740	970	986		200	1000
	C	2000		17000		30000	۵.	35000	1680	1450	2320	9069	ñ	006	4300
	80 1	340000		330000		200000		190000	34000	33000	0056	22000	27	0000	27000
Indicator	ALK	\$82000		000161		34000		710000	264000	310000	290000	234000	77	2000	200000
parameter	HARD	706000		754000		366000		902000	282000	284000	270000	244000	7,7	2000	260000
	TDS	963000		887000		892000	-	977000	327000	323000	320000	284000	7.7	3000	297000
	pH(1)			7.0		7.1		7.0	6.5	7.7	7.7	7.7	•	7.0	7.5
	(C) Puro Jus	32		108		2020		1260	242	398	583	458	4	11	730

TABLE 7-14
SUMMARY OF GROUNDWATER CHEMICAL DATA DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

20 20		_	ELN-82-02A		n	ELN-82-026	970	(2) ELN-82-02C	770-70.	VC0 - 87-173	9cn - 70 - 1773	-030	- 20 - WT3
Sample Type:	**		WELL			WELL		WELL	=	VELL	WELL	ر 4	WELL
DATE SAMPLED: ROUND:	PLED:	12/09/91 ONE		74/27/92 TWO	12/09/91 ONE	- 1	04/26/92 TWO	12/09/91 ONE	04/26/92 TWO	04/11/92 TWO	11/25/91 ONE	04/11/92 TWO	11/25/91 ONE
VOC	HITCE	,					•	ı	1	1	•	•	•
	112TCE	,		i	1		ı	1	1	•	0.702	ı	•
	12DMB	ı		ı	1		1	•	1	ı	•	ı	1
	13DMB	4 .6	s	ı	6.1	S	ı	3.2 S	•	•	ı	ı	•
	ACET	ı		1	1		ı	1	1	ı	•		ı
	C6H6	•		ı	1			1	1		ı	i	•
	CH2CL2	4.9	۵.	7.84 B	5.2	۵.	7.75 B	S.0 P	7.25 B	6.76 B	90'9	7.06	\$. 89.
	CH3CL	1		•	•		ı	•	i		•	1	•
	CHCL3	ı		ı	ı		•	ı	•	•	ı	,	•
	MEC6HS	4.81	۵.	•	6.85	۵.	1	1	1	ı	1	1	•
	MEK	ı		1	1		•	ı	1	•	ı	ı	•
	TCLEE	ı		ı	•		•	ı	ı	•	1	•	1
	TRCLE	1		0.60.¢	1		1	•	1		1	1	•
SVOCs	2E1HXL									1			
	4MP	ı			•		•	•	1	•	,	•	1
	BZEHP	43.8	۵.	46.2 P	33.4	۵.	1	121	ı	•	27.1 P	,	•
	PHENOL	ı		ı	•			•	•	ı	1	1	•
	TRIMBZ									•			1
Metals	٧œ	•		ı	1 .		1 3	1	1 }	ı ş	ı	ı ;	1 }
	BA	130		0.1	2		8	67.0	2	19.3	16.9	13.7	25.3
	BE	1		0.627	1		0.746		0.918	0.706		0.372	• }
	∀ (00001	5	180000	100001	5	19000000	100000	19000000	19000000	DOMENO CI	120000 X	97000
	ž ;	13.9		,	9.11		ŧ	* ! :	, ;	ı	/71	•	
	31	1 }		۱ ;	١ ;		1 \$	7.11	4.63	۱ ۱	•	1	•
	Ξ;	25.3		310	6.56		3	41.3	ı	67.7	ı	1	ı
	9	ı	ı	1 3	1						. ;	1	. ;
	¥	1170	-	2250 T	1140	<u>_</u>	7250 T	1820 T	7350 T	Z20000 T	J 0691	Z4000 T	1320 T
	Ů.	0000	СŢ	77000	0000		910000		8400000	0000086	3000000 GT	X 00019	48000
	Z X	350			45.7		39.5	131.0	¥	86.6	•	1	
	۲ ۲	1		33000 T	16000	_	19000 T	18000 T	27000 T	Z0000 T	1	21000 T	•
	Z	1		7.07	•			18.5	•	,	•	1	9.01
	28	•		ı	8.61		,			•		ı	•
	SE	1		ı	1		ı	•	•	•	4.03	ı	1
	>	ı		1	ı		1	•	ı	•	15.4		†
	NZ	3 5		1	1		49.1	460	33.2	93.1	61.5	1	
Asions	HZ	2300		290	1900		430	2400	97	420	0061	1200	9
	C	00069		38000	20000	_	21000	00061	37000	13000	19000	15000	8100
	804	93000		X 00065	900059	_	24000	44000	28000	310000	200000	220000	91000
Indicator	ALK	628000		658000	751000	0	000099	396000	708000	635000	364000	364000	316000
parameter	HARD	670000		296000	240000	0	728000	\$22000	776000	744000	258000	642000	378000
•	SQL	872000		636000	697000	0	721000	000005	82,5000	947000	691000	648000	420000
	pH(1)	8.9		6.9	6.8		6.9	8.9	6.9	7.1	7	7.3	2.7
		0000		900	77.17		901	0,0	•	9704	, 00	-	

TABLE 7-14
SUMMARY OF GROUNDWATER CHEMICAL DATA -DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:			,	1	70 - 7	Ç					TO A PARTY		970 - 61
Sample Type UNITS:	**	WELL			WELL			WELL	Š	WELL	WELL UGL	WELL	크금
DATE SAMPLED: ROUND:	PLED:	04/11/92 TWO		12/05/91 ONE		04/10/92 TWO	12/05/91 ONE	04/10/92 TWO	12/05/91 ONE	04/10/92 TWO	04/13/92 TWO	12/06/91 ONE	04/12/92 TWO
VOCs	HITCE	,		,		ı	,		•			 	1
	112TCE	1		1		ì	J	•	ı	1	1	ı	1
	12DMB	ı		•		1	ı	•	1	1		1	ł
	ISDMB	1		1			į	ı	•	ı	ı	1	1
	ACET	•		ı		ı	J	1	1	ı		1	1
	C6H6			ı			, ;	1	1 }	1 3		1 3	1 ;
	CH2CL2	•	20	4.31	_	5.39 BB	3.62	S.29 B	5.39	8.43 B	7.06	4.12 P	23 25
	CHACL	1		ł		i	ı	•	ı	ı	, ,	t	1
	CHCL	i		1		ı	ı	•	ı	1	0.875	ı	,
	MECOHS	ſ		ı		ı	ı	•	ı	ı	ı	ı	ı
	MEK	ı		ı		ł	ļ	•	t	í	ı	;	•
		1		ı		ı	1 6	1	•	ŀ		ŀ	1
	KCLE	•		•		1	0.967	-	-	•		- (1
SVOCS	ZEIHXL											12 21	
	4MF	í		1		ı	ı	1	ı	1 ;	1 ;	1 }	ı
-	BZEHF	ſ		1		ı	1	ı	ı	2	90.9	7	1
-	TENOL Telver	1		ı		ı	ı		ı	1	ı		1
Metals	AG			-				1		1		1	
}	8	17.5		2		<i>L</i> 9	26.3	23.9	28.7	25.4	992	29.3	26.4
	BE	1		ı		i	ļ		•	1	1	1	•
	Š	73000		120000	×	120000 X	900059	00099	74000	38000	470000	00059	00009
	X	ı		7.15		,	48.5	•	15.4	\$14	<u>ş</u>	7.74	•
	2	1		8.46		11.9	8.2	1.7.1	1	4.89	27.5	1	\$.69
	FE	ı		77.3		29.9	3 8	•	67.2	38.3	ı	29.4	ı
	9H	1	í	1	1	1	ı ;	• •	1 }			1	ı
	¥ ;	2840 1888	-	2000	_	7 0987 1 2000	1 031 T	T 0657	T 0191	21000 T	8700 T	1 09E1	9:1
	2 2	39000		32000		4/000	3/00	Syddo	45000	32000	1		31000
	Z 4 Z 2	130	F	1200	F	1000	C. 1	T 00016	1 (- T	1000	• 1	+ 003×
	Ž	1	•	3 1	•	9.45	24.4	- 1	· •	8 1	3	ı ı	3
	PB	í		ı		ı	J	•	,	ı	•	ı	•
	SE	1		i		ı	,	1	ı	ì	•	ı	1
	>	í		1		ı	•	ı	1	ı	12.2		88.2
	ZN	1		2300		3900	J	37.4	ı	i	ı	×	i
Anions	FIX	1100		\$800		4000	3700	1300	0045	2400	900+	7300	4300
	5	6200		4600		3500	2900 P	2900 P	4: 500	7200	13000	8100	9000
	\$04		×	29000		31000	28000	27000	28000	23000	00005	29000	30000
Indicator	ALK	350000		474000		4.50000	238000	724000	268000	245000	622000	214000	230000
parameter	HARD	332000		318000		468000	303000	296000	320000	210000	1120000	228000	220000
	TDS	371000		\$13000		496000	343000	30,000	355000	279000	435000	265000	284000
	pH(1)	7.6		0.9		6.9	0.0	7.6	0.9	4. /	8 2.	7.7	7.7
•	CO TOUR	Ş		Ş		707	72	377	¥CF	101	5	Cyr	

TABLE 7-14
SUMMARY OF GROUNDWATER CHEMICAL DATA DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

WELL UGL ONE ONE ONE ONE ONE ONE ONE ONE ONE ONE	Site ID:	3	(4) ELN-89-04A	Y	ELN-89	1-04B	ELN-8	9-06B	ELN-91-07A	1-07A	ELN-91-07B	1-07B
IIITCE	ple Type: TS:		WELL		WEI	3-	WELL	7. 	WELL	그 ;;	WELL	ᆲᇎ
IIITCE	TE SAMPLED: JND:	12/05/91 ONE		04/27/92 TWO	12/05/91 ONE	04/25/92 TWO	12/08/91 ONE	04/10/92 TWO	12/08/91 ONE	04/11/92 TWO	12/08/91 ONE	04/11/92 TWO
112TCE		1		1		•	1	•		•	ı	
12DMB		ı		,	1	ı	ı	1	1	•	•	i
13DMB	12DMB	ı		ı	ı	1	1	,	,	1	4.4 S	t
ACET - C6H6	13DMB	ı		•	1	•	ı	ı	ı	1	9.5 S	ı
CH46 - CH46 - CH2CL2 4.8 P 7.65 B 5.2 P CH2CL2 3.65	ACET	ı		ı	,	ı	ı	1	•	1	12 S	1
CH2CL2 4.8 P 7.65 B 5.2 P CH3CL AECHS MECKIT AECHS TCLEE TTCLEE TTCLEE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCLE TTCL TTCL	C6H6	ı				ı	1	1	1		2.65	•
CH3CL 3.65	CH2CL2	4.8	۵.			6.08 B	5.29	7.75 BB	a. v.	.5.98 BB	S.1 P	5.49 B
CHCL3	CH3CL	3.65		ı	1		1	1	ı		•	1
MEK	CHCL3	ı		i	1	1		ı	•	1	•	ı
NEK	MEC6HS	ı		ı	•	ı	•		ı	ı		
TCLEE	MEK	ı		ı	•	1	ı	•	•	1	99	73 S
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TABLE 7–14
SUMMARY OF GROUNDWATER CHEMICAL DATA –
DETERRENT BURNING GROUND/ EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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	C6H6	,	1	ı	1	J	ı
	CH2CL2	5.2 P	7.06 B	3.24 P	7.55 B	3.63 P	7.45 B
	CH3CL	•	ı	1	1	1	•
	CHCL3	ı		•	1	•	ı
	MEC6HS	1	1	•	1	ı	t
	MEK	ı	1	•	i	ı	ı
	TCLEE	1	ı	1	ı	ı	•
	TRCLE	ı	0.276 P	•	•	1	ı
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	office		7.3	7.0	. 02		÷
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TABLE 7-14 SUMMARY OF GROUNDWATER CHEMICAL DATADETERRENT BURNING GROUND/ EXISTING LANDFILL REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

codes:
Pagging.
1
Z Z

	are reported in the recovery only the preserved results are reported in this table. ELN-89-04A was represented on 12 July 10/91 for TAL and hardness, original sample dated 12/5/91 was not filtered in the field. Analytical results from both samples are the results from both samples.	are reported in the ALDMLA, only the illiered results are reported in this table. Micrograms per liter (parts per billion) Volusia creasia communications	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyse in a certified method	Analyte recovery outside of certified range, but within acceptable limits	
				•			*			*			•	
399	€	190 AOC	SVOC	Blank cell	•	5	6	9	<u>م</u>	~	S	H	×	

USA I HAMA chemical codes are defined in the RI Report Glossary

Anwadix K contains complete analytical results.

TABLE 7-15
CHEMICAL AND PHYSICAL PROPERTIES OF MAJOR ORGANIC CONTAMINANTS DETERRENT BURNING GROUND/EXISTING LANDFILL²

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

				WATER		HEWIY'S LAW CONSTANT		
CHEMICALS	CAS#	MOLECULAR WEIGHT (g/mole)	DENSITY	Solubility (mg/l)	VAPOR PRESSURE (mmHg)	(atm. m³/mole)	K. (mf/g)	(mg/mg)
Volatile Organic Compounds								
111TCE	71-55-6	133	1.32	1.50×10 ³	123	1.44×10 ²	152	316
112TCE	79-00-5	133	1.32	4.50×10³	61	7.42×104	8	117
TRCLE	79-01-6	132	1.45	1.10x10 ³	57.9	9.10×10 ³	52	240
C6H6	71-43-2	78	0.8786	1.75×10 ³	95.2	5.58×10 ⁻³	8	132
XYLEN	1330-20-7	901		1.98×10²	01	7.04×10 ³	240	1.82×10³
(ortho)	95-47-6	901	0.86	1.75×10 ²	01			8.91×10 ²
(meta)	108-38-3	901	0.864	1.30x10 ²	01			1.82x10³
(para)	106-42-3	901	0.86	1.98×10 ²	0			1.41×10³
Semivolatiles								
24DNT	121-14-2	182	1.32 (CRC)	2.40×10 ²	5.10×10 ⁻³	5.09×10 ⁻⁸	45/250 (HO)	1.29×10 ⁶ 100
26DNT	606-20-2	182	1.28 (CRC)	1.32×10³	1.80x10 ²	3.27×10	85	8
NNDPA	86-30-6	1981	1.23 (CRC)	1.13×10²	6.3Ex10⁴	1.4×10*	650 (ADL)	1.35x10³ (ADL)

Notes:

See List of USATHAMA Chemical Codes for definitions of chemical abbreviations.

A All data from the Risk Assessment Guidance for Superfund (USEPA, 1989a) unless otherwise noted: ADL = Arthur D. Little, 1985; CRC = CRC Handbook of Chemistry and Physics (Weast, 1980-81); and HO = Ho, 1988.

K_x = partition coefficient between the organic chemical and carbon.

K_{or} = partition coefficient of the chemical between octanol and water.

TABLE 7-16
ESTIMATES OF DISTANCES TRAVELED BY
ORGANIC CONTAMINANTS IN GROUNDWATER

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		Vc = V/[1	+ $K_d(b/n)$] $K_d =$	$Vc = V/[1 + K_d(b/n)] K_d = K_{oc} * f_{oc}; f_{oc}$ is assumed to be 0.01	ned to be 0.01		
Deterrent Burning Ground	g Ground						
UPPER FLOW ZONE	CONTAMINANT VELOCITY VC, Ft/Yr	PARTITION COEFFICIENT K _a , m£/g	. ₩	Soit Density b, g/mt	SOIL POROSITY N=POROSITY	YEARS	DISTANCE, FL.
Groundwater	20.0	NA A	AN AN	2	0.3	40	0.008
111TCE	1.80	1.52	152	2	0.3	40	71.9
24DNT	5.0	0.45	45	2	0.3	40	200
24DNT	1.13	2.50	250	2	0.3	40	45.3
26DNT	2.80	0.92	92	2	0.3	40	112.1
NNDPA	0.45	6.50	ලදුර	8	0.3	4	18.0
LOWER FLOW ZONE	Vc, ft/yr	K _a , m£/g	3 8	b, g/m	N= Porosity	YEARS	DISTANCE, FT.
Groundwater	150	A N	Ϋ́	2	0.3	6	6,000
111TCE	13.5	1.52	152	2	0.3	9	539
24DNT	37.5	0.45	45	8	0.3	40	1,500
24DNT	8 49	2.50	250	2	0.3	40	340
26DNT	21.0	0.92	36	2	0.3	40	841
NNDPA	3.38	6.50	650	2	0.3	40	135
Notes:							
NA = not a ft/yr = feet p	not applicable feet per year	mt/g = g g/mt = g	milliliters per gram grams per milliliters	See list of Labbreviations	See list of USATHAMA Chemical Codes for definitions of chemical abbreviations	ical Codes for c	definitions of chemical

W0039213T.7/14

TABLE 7-17 COMPOUNDS OF POTENTIAL CONCERN DETERRENT BURNING GROUND SUBSURFACE SOIL

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Companyo	EXPOSURE POINT CONCENTRATION
COMPOUND	₽ 9/9
24DNT	37,000
26DNT	1,400
3NT	6.9
AS	7.88
B2EHP	4.35
C6H6	5.25
CR	13.2
DNBP	62
FANT	0.139
MEC6H5	0.138
NI	10.2
NIT	18.7
NNDPA	2,200
PHANTR	0.183
PYR	0.144
SO4	5.19
TXYLEN	0.001
ZN	26.7

Notes:

Exposure point concentration is the maximum detected concentration. $\mu g/g = milligrams$ per gram, equivalent to parts per million (ppm)

Assessment of subsurface soil contamination (2 to 12 feet) was performed using samples from borings DBB-91-01 through DBB-91-03.

TABLE 7-18 SUMMARY OF RISK ESTIMATES DETERRENT BURNING GROUND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Future Construction Worker	Soil Ingestion	1x10 ⁻⁴	0.2
	Inhalation of Particulates	4×10 ⁻⁸	0.000009
	Total for Construction Worker	1x10 ⁻⁴	0.2

TABLE 7-19
COMPARISON OF GROUNDWATER TO STANDARDS
UNITS: \(\mu g/\ell\)

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	FREQUENCY			SDWA (1)	(1)	WI GROUNDWATER STANDARDS (2)	R STANDANDS (2)	
COMPOUND OF POTENTIAL CONCERN	оғ Ветестом	MAXIMUM DETECTED CONCENTRATION	MINIMUM DETECTED CONCENTRATION	MCL	MCLG	E S	PAL	CALCULATED CONCENTRATION (3)
111TCE	8:80	12.1	3.07	200	200	200	40	
112TCE	5:8	2.31	0.365	ıo	n	9.0	90:0	
26DNT	2:80	2.17	1.29	•	•	90.0	0.005	
BA	56:56	760	13.7	2,000	2,000	1,000(c)	200(c)	
BE	10:80	1.14	0.362	•	,	•	•	0.02
8	1:80	3.23		ĸ	10	10(d)	1(d)	•
ರ	80:80	000'69	1,450	250,000(a)	•	•	•	
85	38:80	140	4.98	100	6	50(e)	5(e)	
3	25:80	77.2	4.7	F	1,300		•	
НG	1:81	4.25	•	7	6	84	0.2	
MN	21:56	480	7.85	50(a)	•	50(f)	25(f)	
NA	38:56	33,000	2,890	20,000(b)	,	•		
TIN	80:80	16,000	130	10,000	10,000	10,000	2,000	
NNDPA	3:80	16.7	1.02					ଯ
84	4:80	8.61	5.94	Ħ	0	(B)OS	5(9)	
Z	8:80	24.4	9.45	100	100	•	•	•

DETERRENT BURNING GROUND/EXISTING LANDFILL COMPARISON OF GROUNDWATER TO STANDARDS UNITS: Mg/8 TABLE 7-19

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

So case of the sound of	FREQUENCY			SDWA (1)	(1)	WI GROUNDWAT	WI GROUNDWATER STANDARDS (2)	
POTENTIAL CONCERN	DETECTION	CONCENTRATION	MINIMUM DETECTED CONCENTRATION	MCL	MCLG	ES	PAL	CALCULATED CONCENTRATION (3)
SE	2:80	5.01	4.03	SS.	950	10(h)	18)	
SO4	80:80	630,000	9,500	250,000(a)		250,000(f)	125,000(f)	
>	13:56	19.1	4.14	•	•	•	: •	5 00
ZN	21:80	3,900	20.8	5,000(a)		5,000(f)	2.500(f)	7.300

Sources:

- U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards." Office of Water, Washington, D.C., August 1991; EPA, 1991, "Fact Sheet: National Secondary Drinking Water Standards," Office of Water, Washington, D.C., September 1991; and EPA, 1990, "National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule," 57FR31776, July 17, 1992 (see Subsection 3.6 for details). Ξ
 - Wisconsin Administrative Code, Chapter NR 140.10, Table 1 (see Subsection 3.6 for details). ର ତ
 - Calculated to be protective at risk of 10° or HI of 1 (see Subsection 4.5 for details).

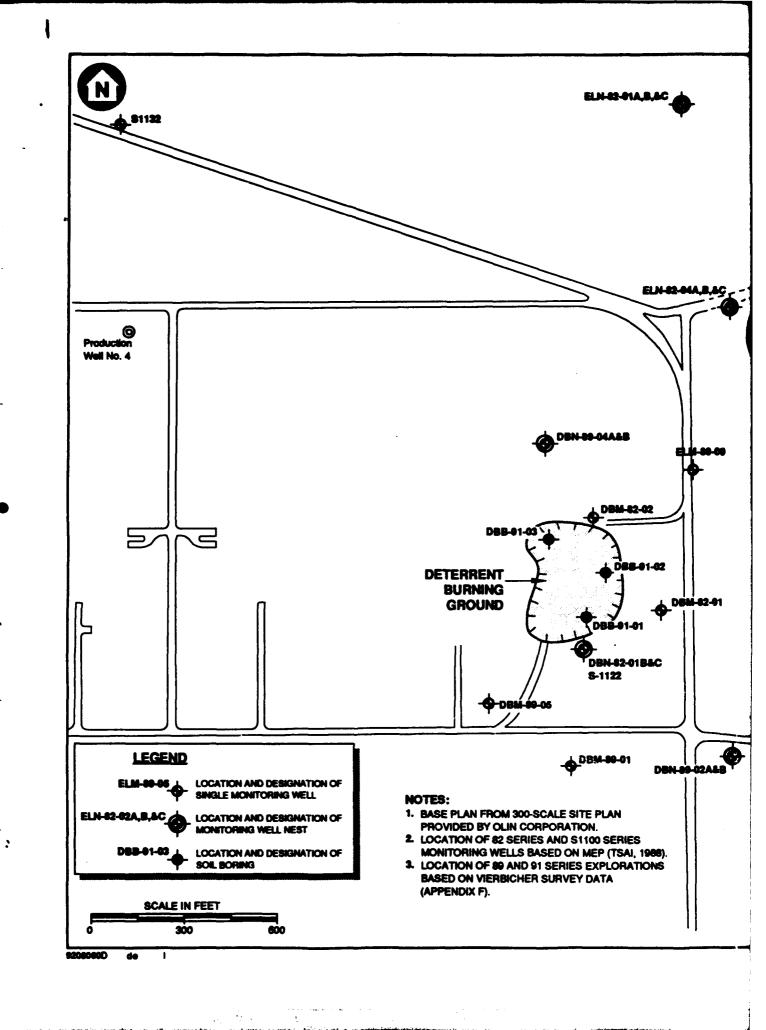
- Secondary drinking water standard, suggested level.
- Reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet. Wi proposing change to ES = 2,000 $\mu g/t$ and PAL = 400 $\mu g/t$ Wi proposing change to ES = 5 $\mu g/t$ and PAL = 0.5 $\mu g/t$ Wi proposing change to ES = 100 $\mu g/t$ and PAL = 10 $\mu g/t$
- 303555B
- Value for protection of public welfare (usually aesthetic concerns) rather than for protection of human health
 - WI proposing change to ES = 15 $\mu g/t$ and PAL = 1.5 $\mu g/t$ WI proposing change to ES = 50 $\mu g/t$ and PAL = 10 $\mu g/t$
- micrograms per liter MGL MCL MCL

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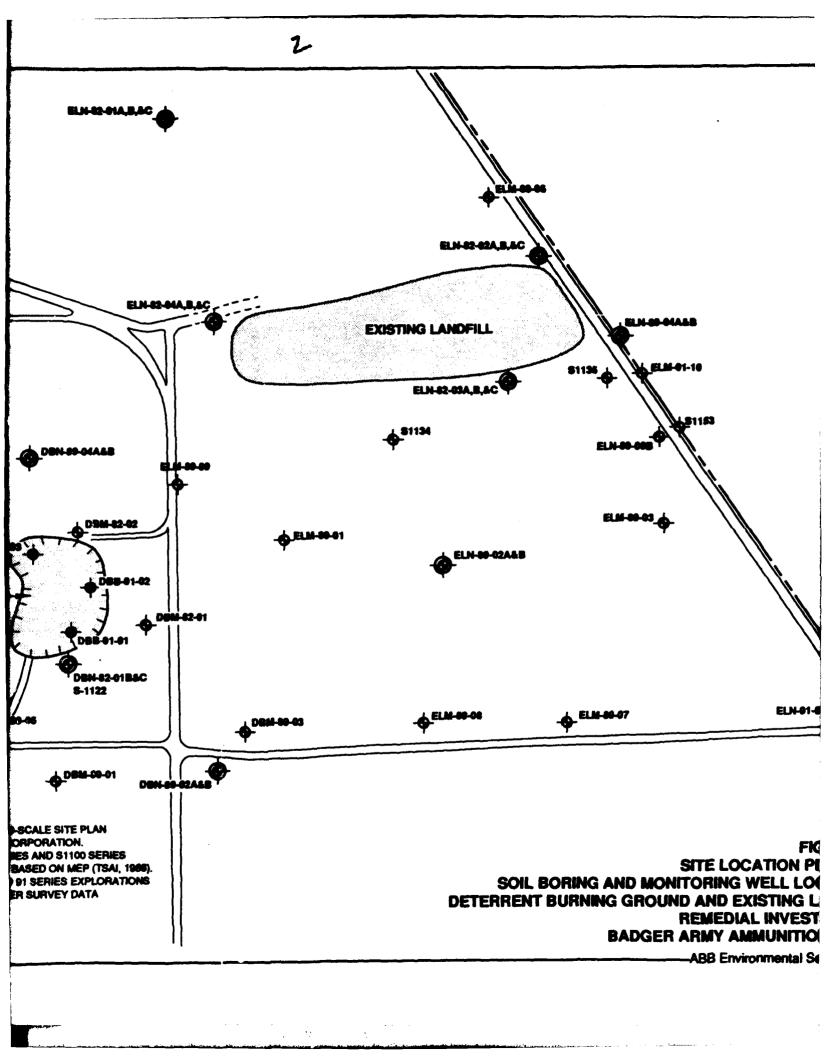
Treatment technique requirement in effect Copper action level - 1,300 µg/2 Lead action level - 15 µg/

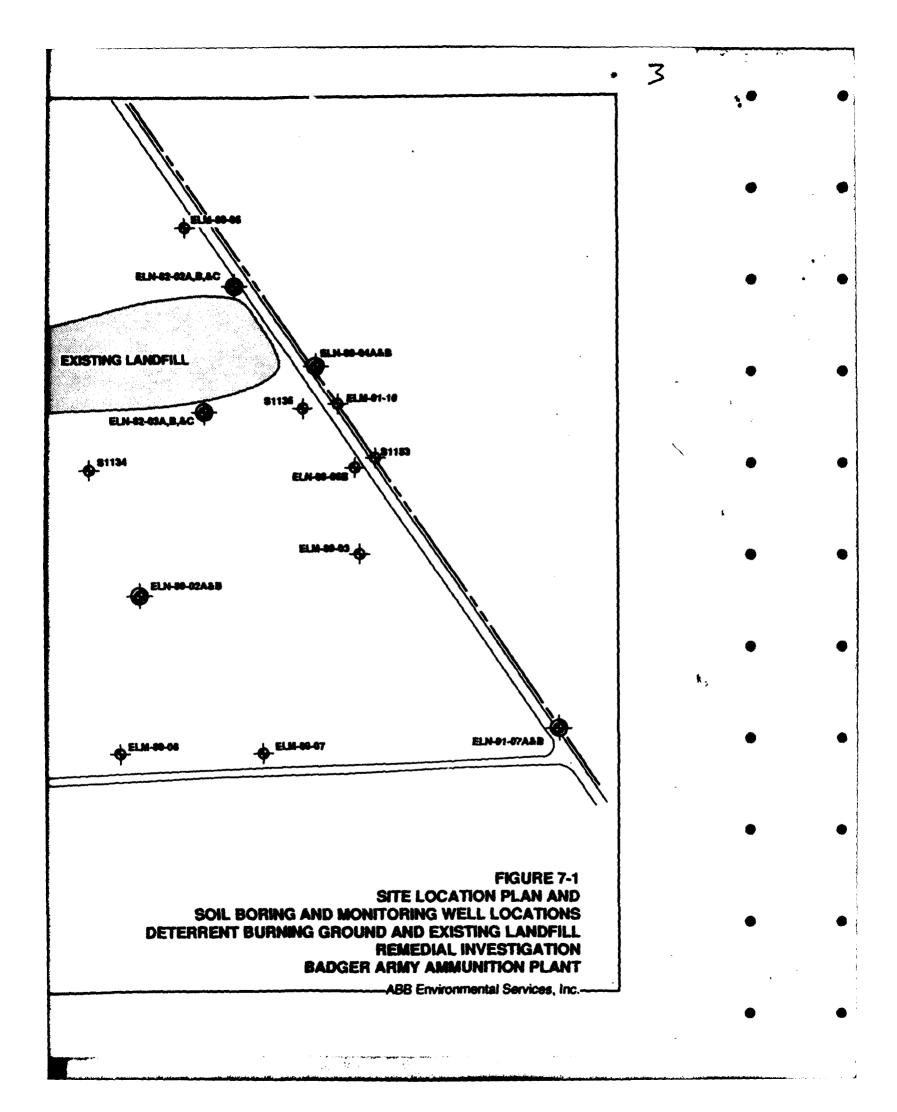
- Maximum Contaminant Level Safe Drinking Water Act
 - Maximum Contaminant Level Goal
 - Wisconsin
 - Enforcement Standard
 - Preventive Action Limit
- W0039213T.7/20

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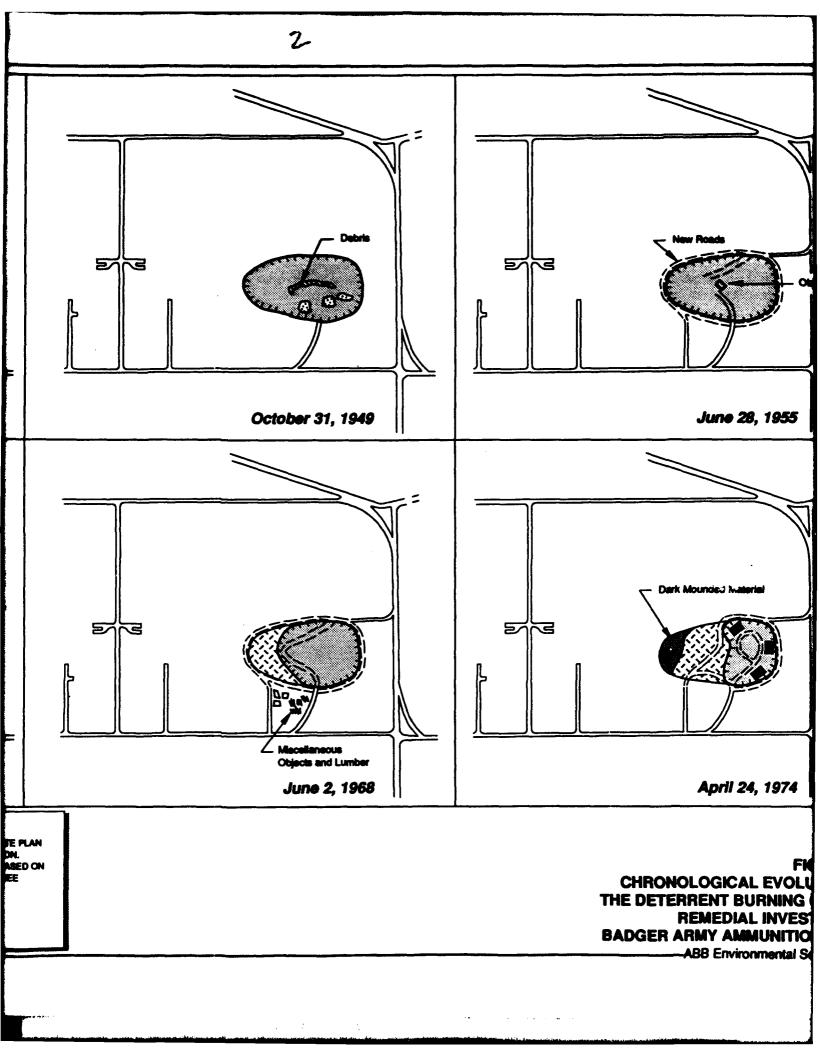
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57 EV/CE March 20, 1944 **MAS** 5 Miscellaneous Objects and Lumber September 11, 1962 LEGEND NOTES: TOP EDGE OF SLOPE 1. BASE PLAN FROM 300 SCALE SITE PLAN PROVIDED BY OLIN CORPORATION. AREA OF ACTIVITY 2. CHRONOLOGICAL EVOLUTION BASED ON AIR-PHOTO INTERPRETATION. SEE ACCESS ROAD SECTION 7.1. MOUNDED MATERIAL 0 FILLED AREA INTERPRETED DETERRENT BURNING PIT 9206100D

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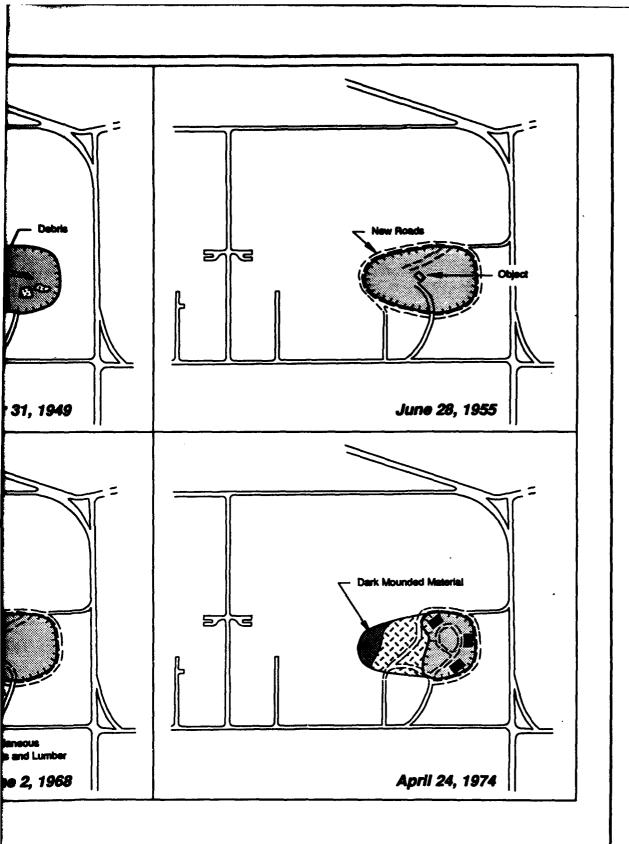
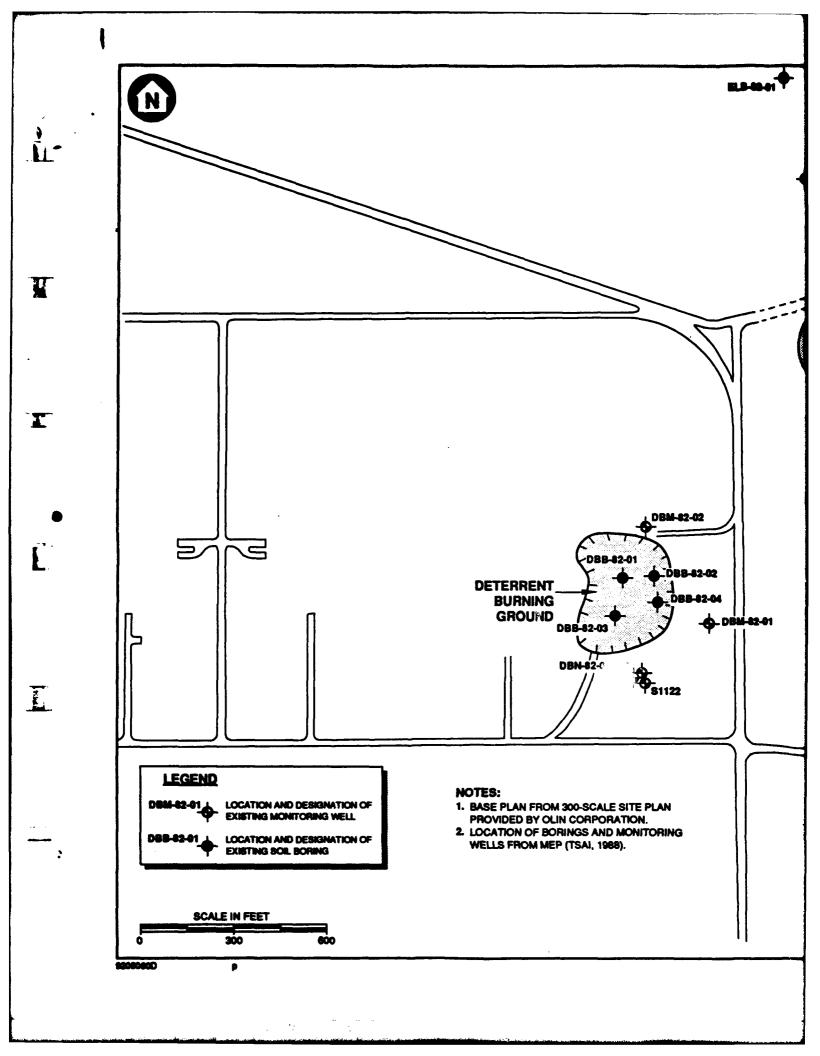
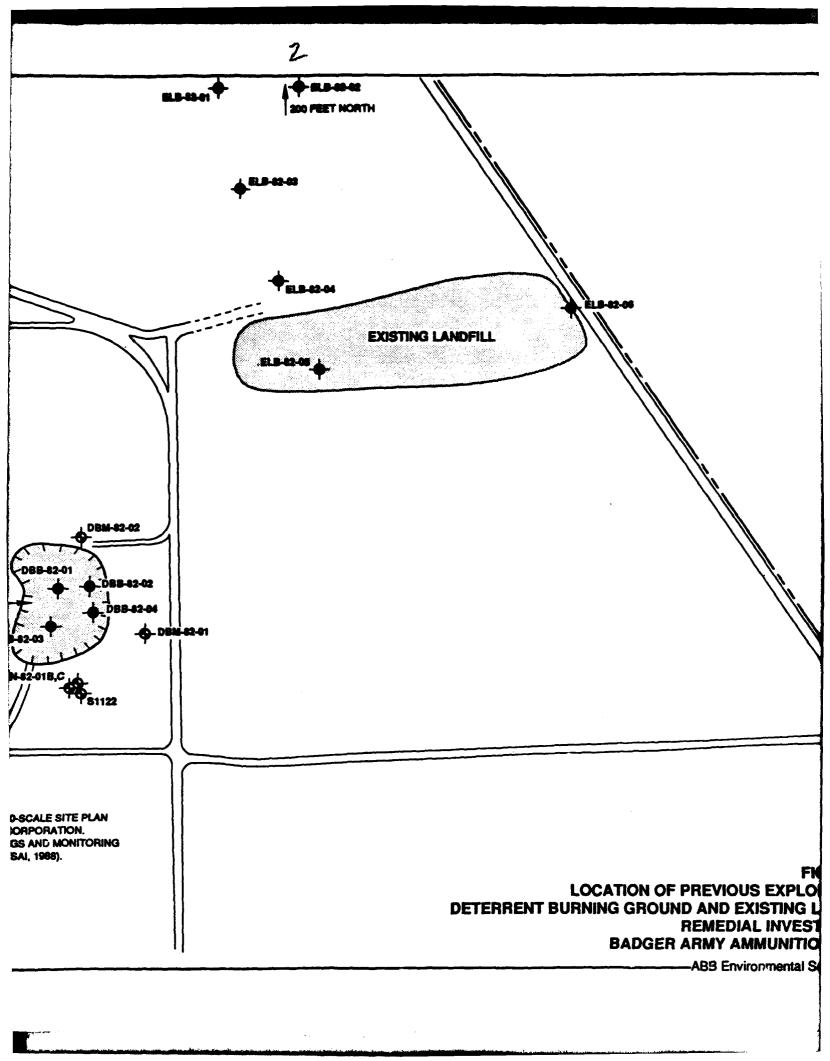
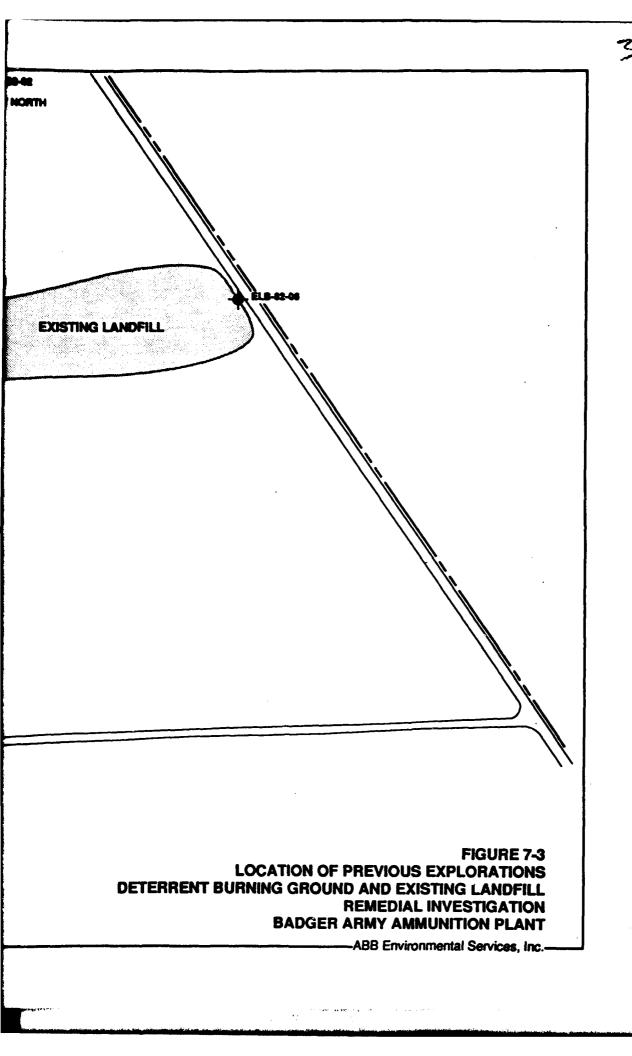
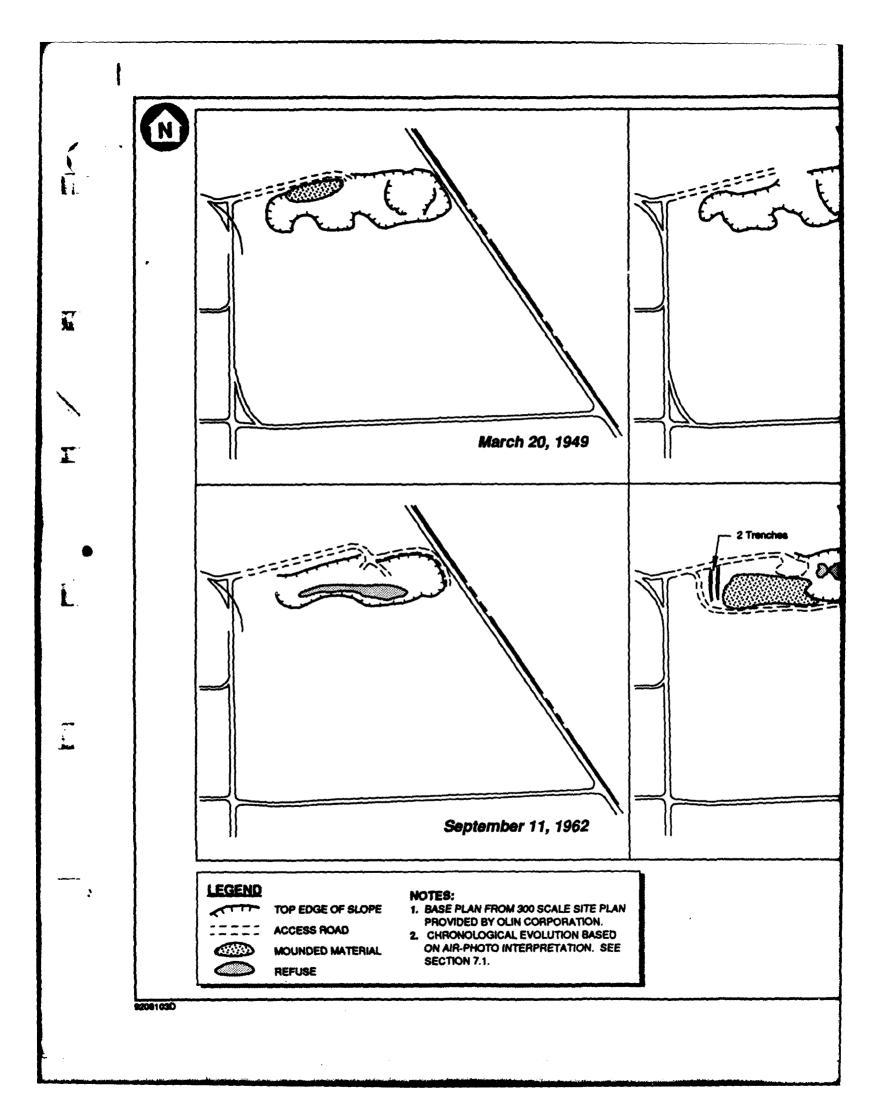


FIGURE 7-2
CHRONOLOGICAL EVOLUTION OF
THE DETERRENT BURNING GROUND
REMEDIAL INVESTIGATON
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.-









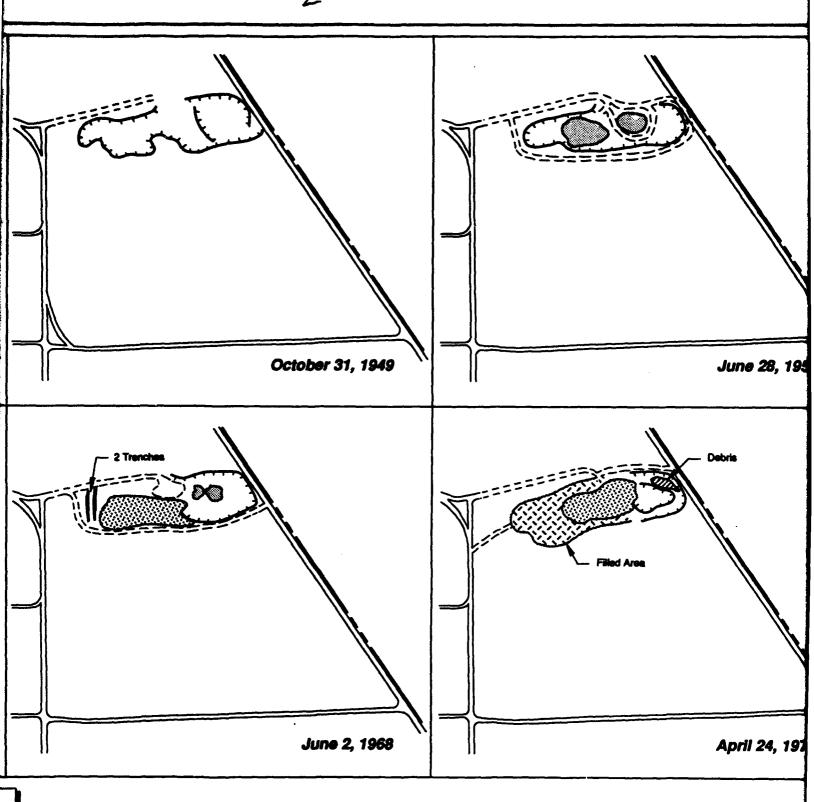
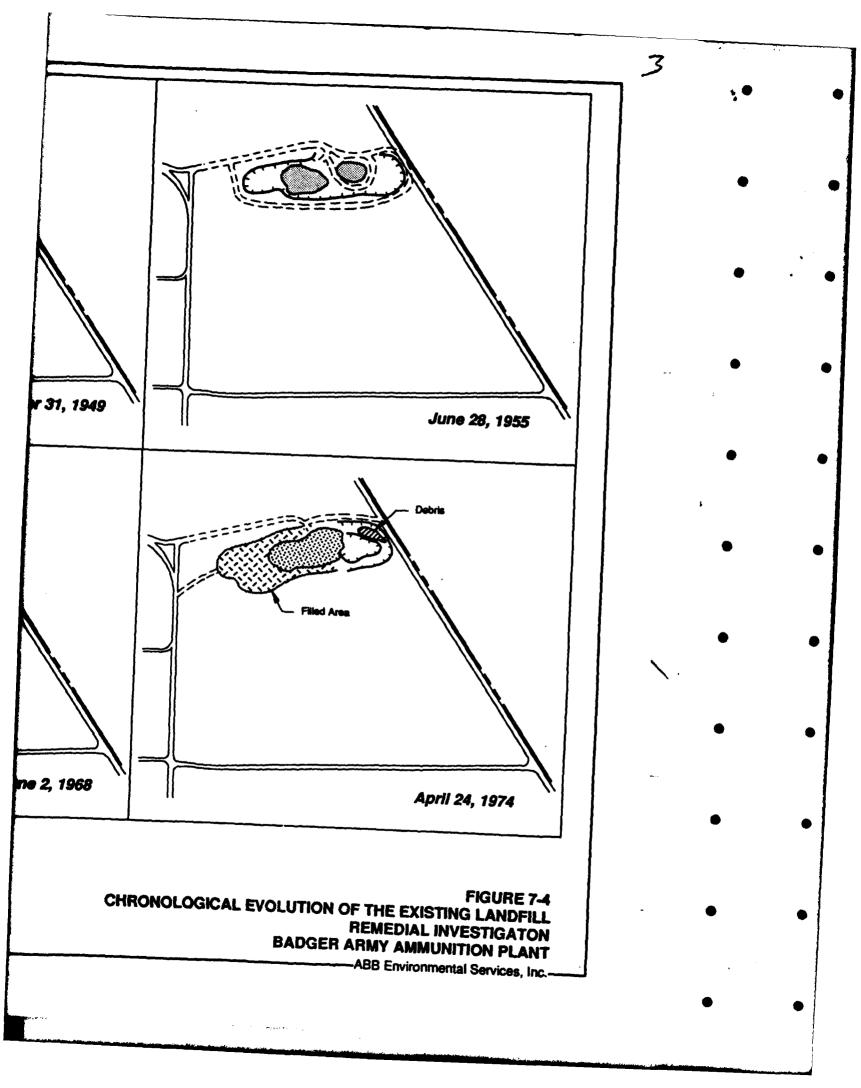
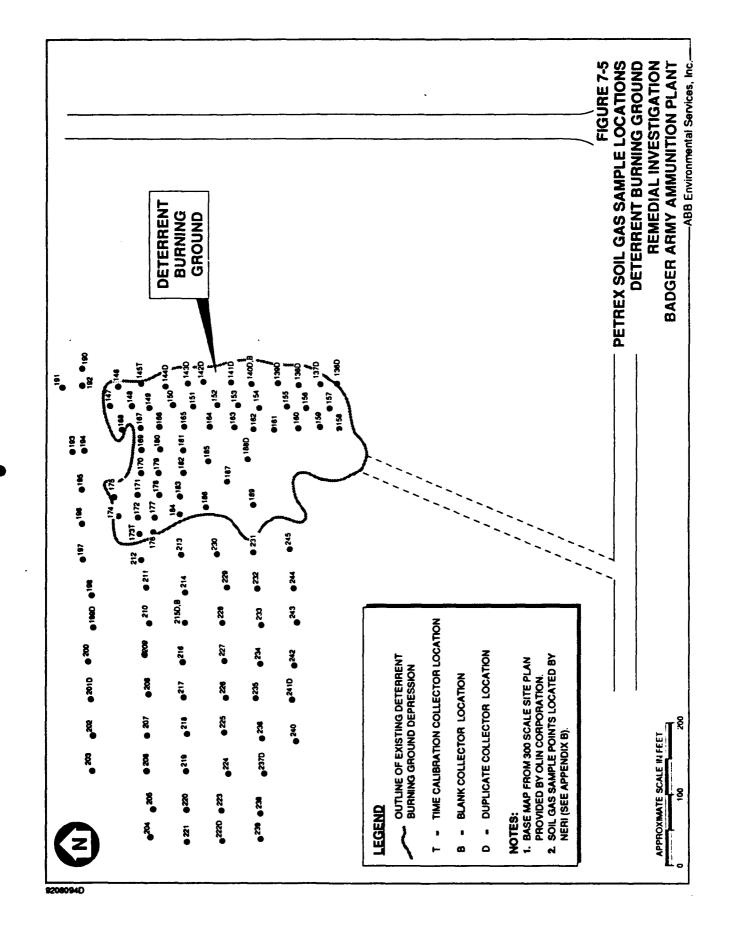
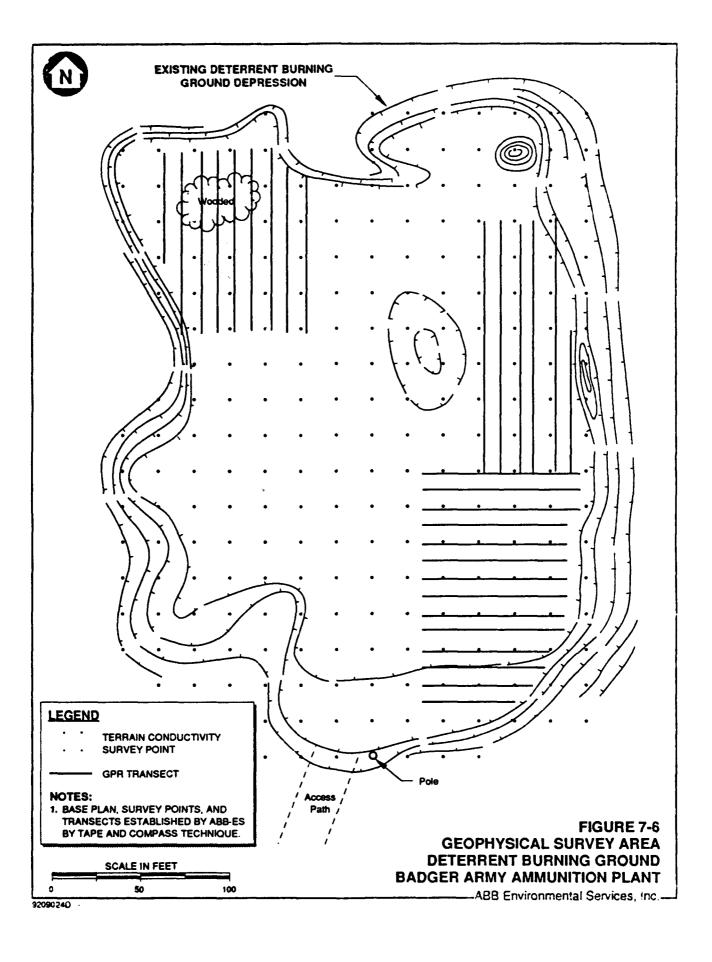


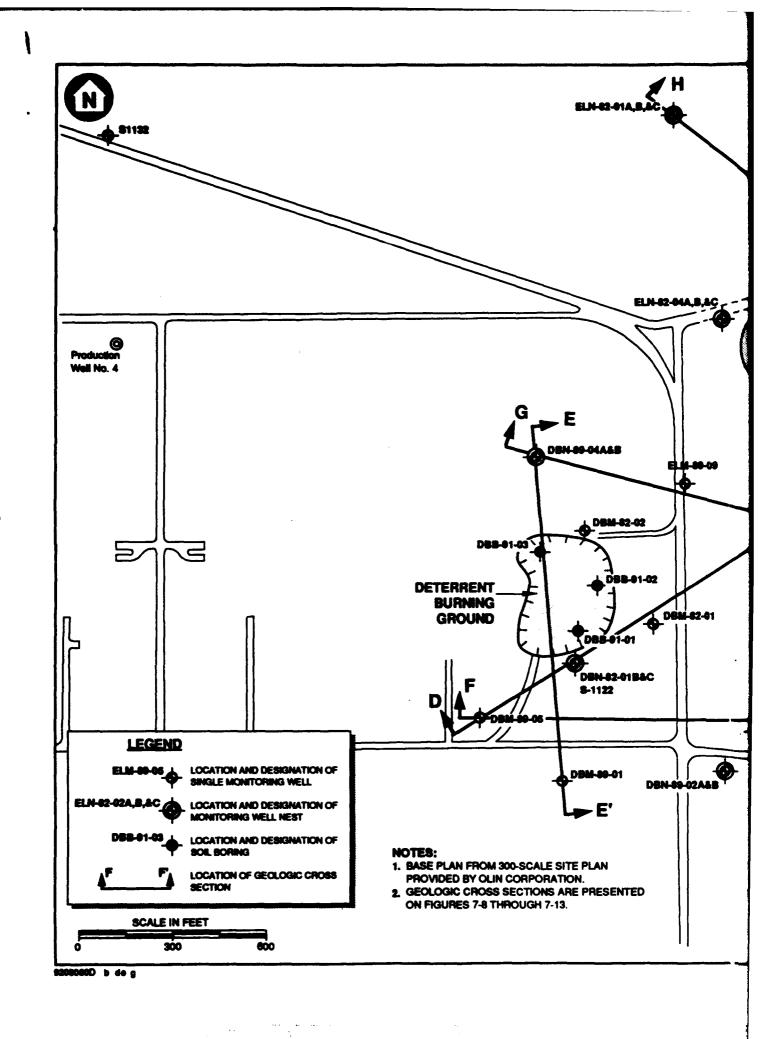
FIGURE CHRONOLOGICAL EVOLUTION OF THE EXISTING LA REMEDIAL INVESTION BADGER ARMY AMMUNITION

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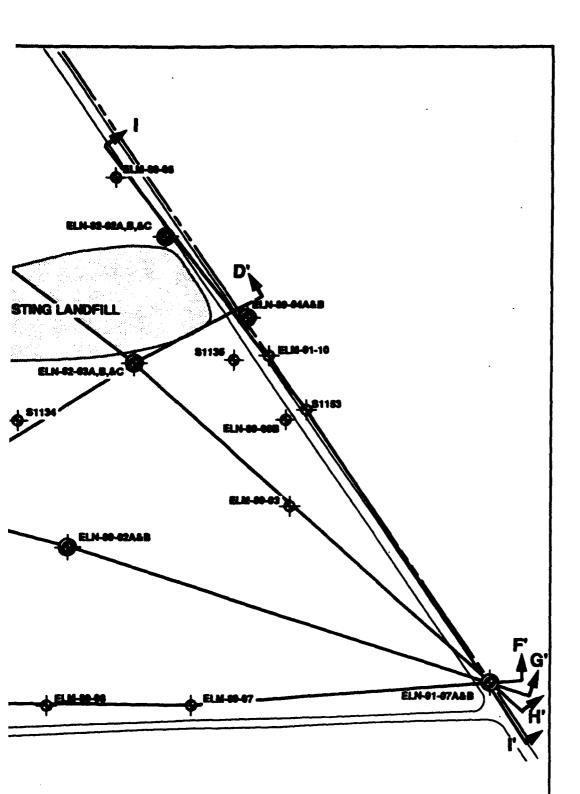
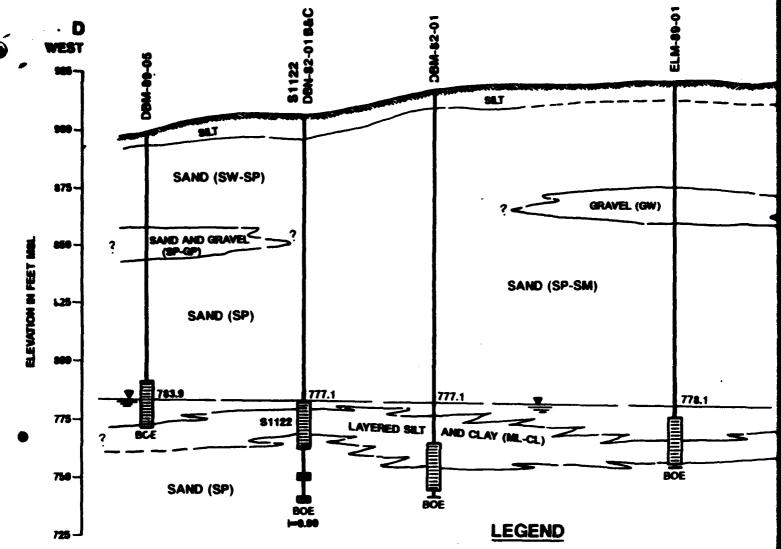


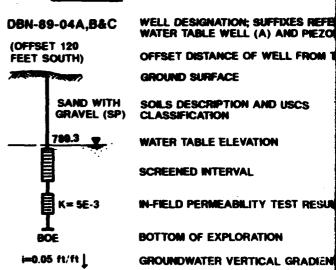
FIGURE 7-7
LOCATION AND ORIENTATION OF GEOLOGIC
CROSS SECTIONS
DETERRENT BURNING GROUND AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

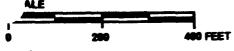
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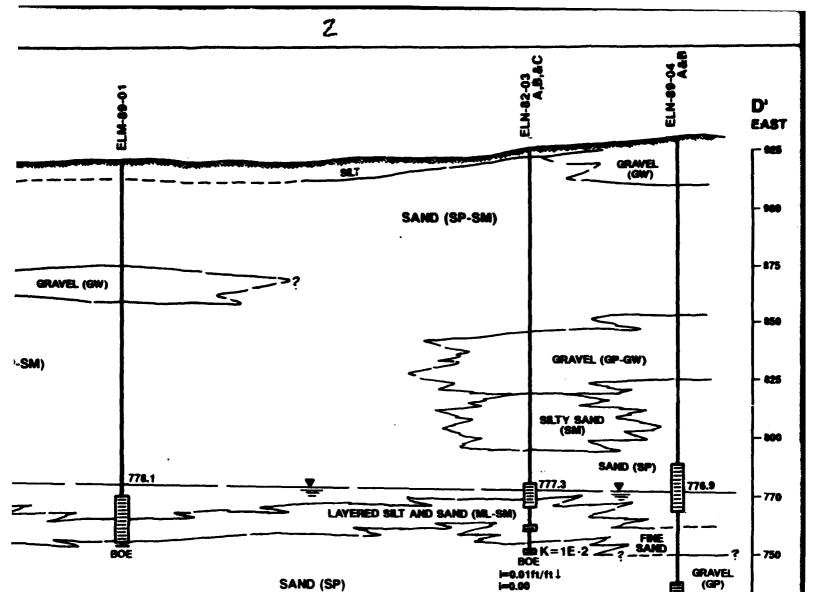
NOTES

- 1. SEE FIGURE 7-7 FOR LOCATION AND ORIENTATION OF PROFILES.
- 2. PROPLES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
- 3. ON MULTIPLE WELL NESTS, GRADIENTS ARE LISTED IN ORDER OF SHALLOW TO DEEP WELLS; i.e., A TO B, B TO C, C TO D.
- WATER LEVELS MEASURED IN WATER TABLE WELLS ON 12/15/91 ARE LISTED.
- 5. WATER LEVEL IN \$1122 REFLECTS A COMBINATION OF BOTH SHALLOW AND DEEP FLOW SYSTEMS.
- B. LAYERED SILT AND CLAY GRADES TO FINE SAND AND BECOMES DISCONTINUOUS EAST OF ELN-82-83C.





VERTICAL EXAGGERATION 1:5



SAND (SP)

WELL DESIGNATION; SUFFIXES REFER TO WATER TABLE WELL (A) AND PIEZOMETER (B&C)

OFFSET DISTANCE OF WELL FROM TRANSECT

GROUND SURFACE

SOILS DESCRIPTION AND USCS CLASSIFICATION

WATER TABLE ELEVATION

SCREENED INTERVAL

IN-FIELD PERMEABILITY TEST RESULT IN cm/sec

BOTTOM OF EXPLORATION

GROUNDWATER VERTICAL GRADIENT

GEOLOGIC CROSS SE DETERRENT BURNING GROUND AND EXISTING REMEDIAL INVES BADGER ARMY AMMUNITI

ABB Environmental

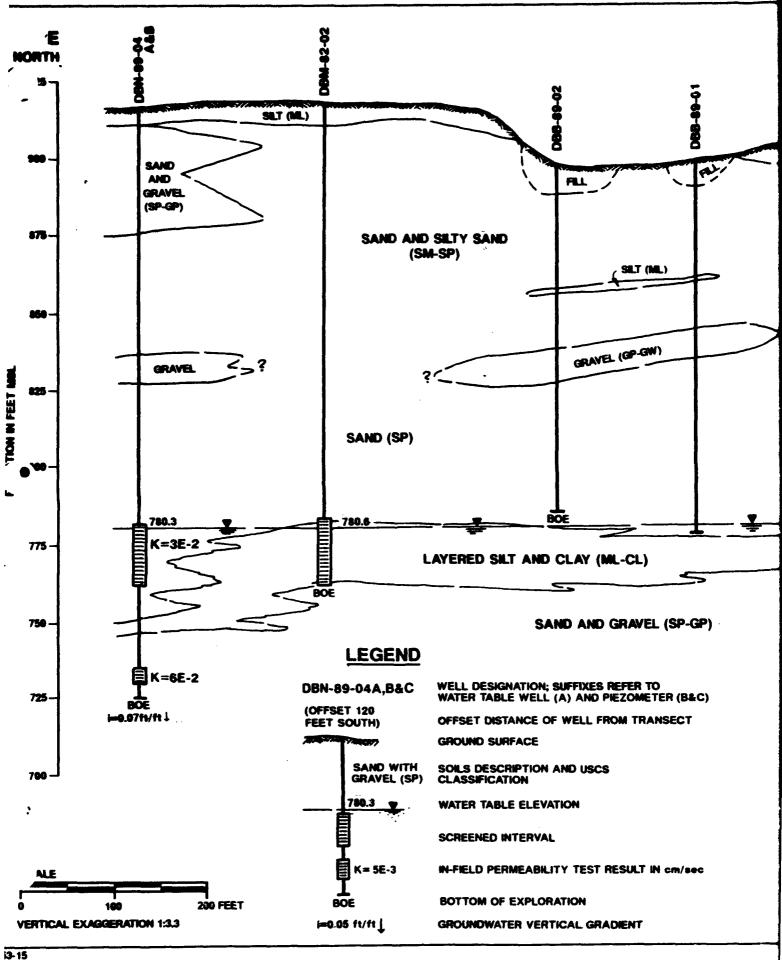
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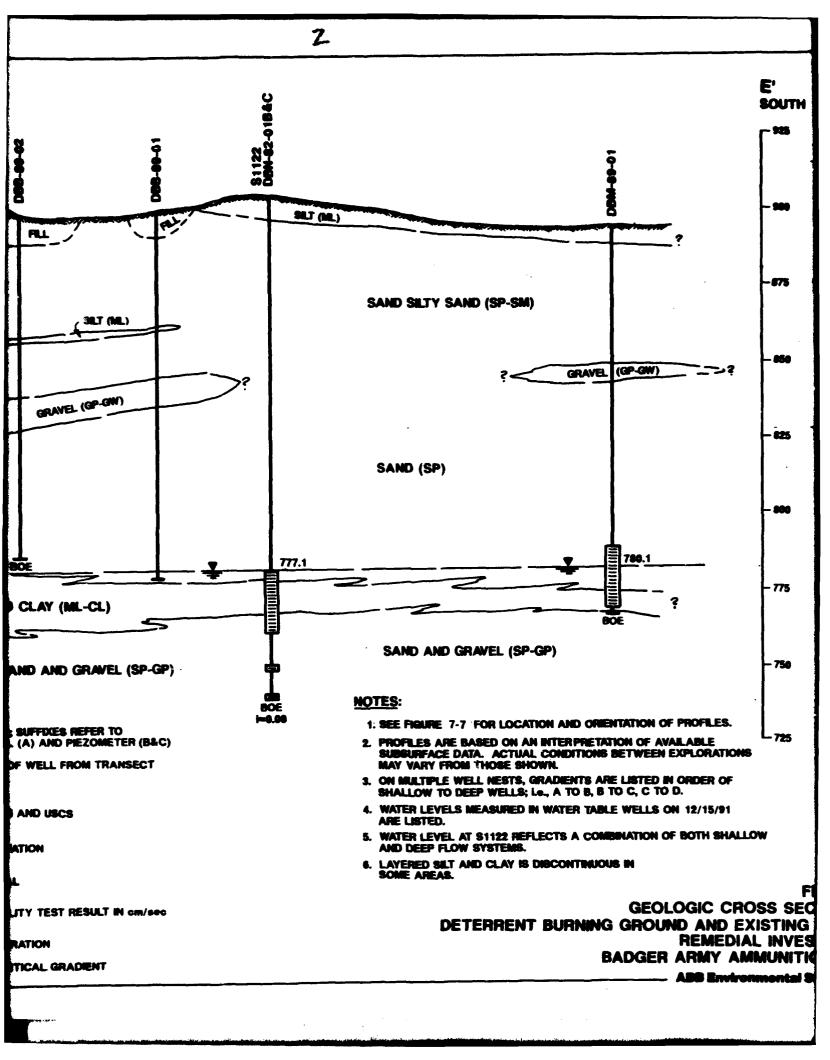
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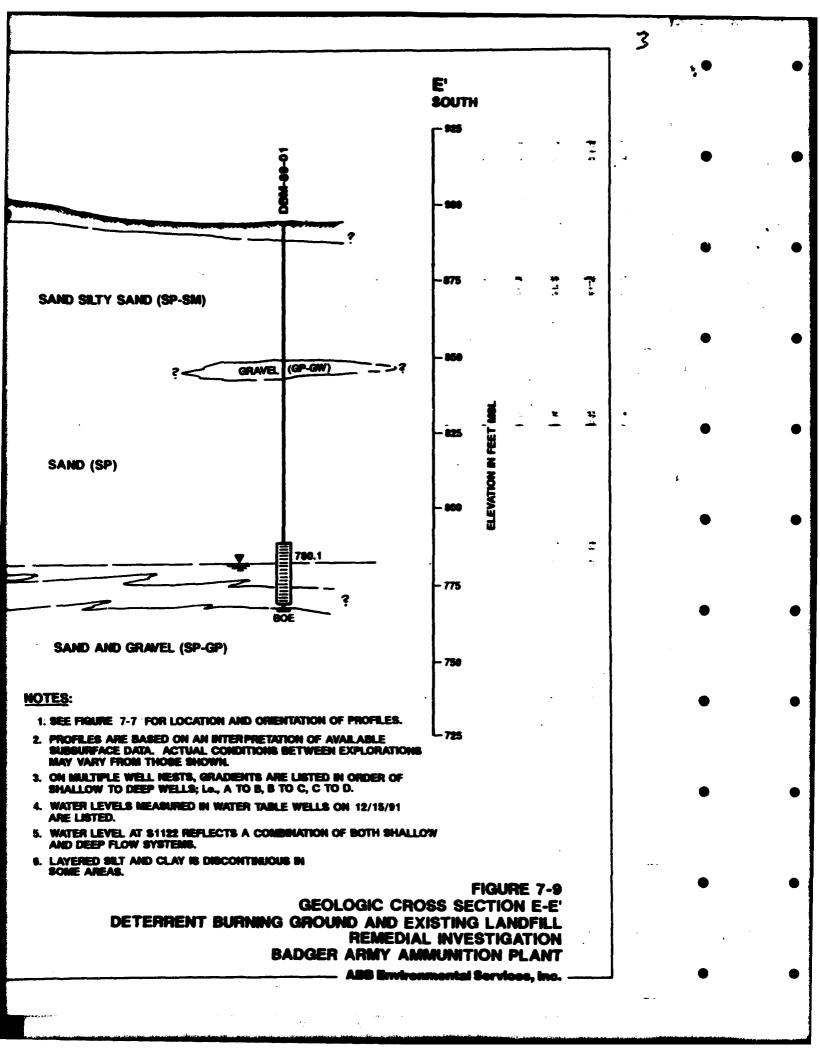
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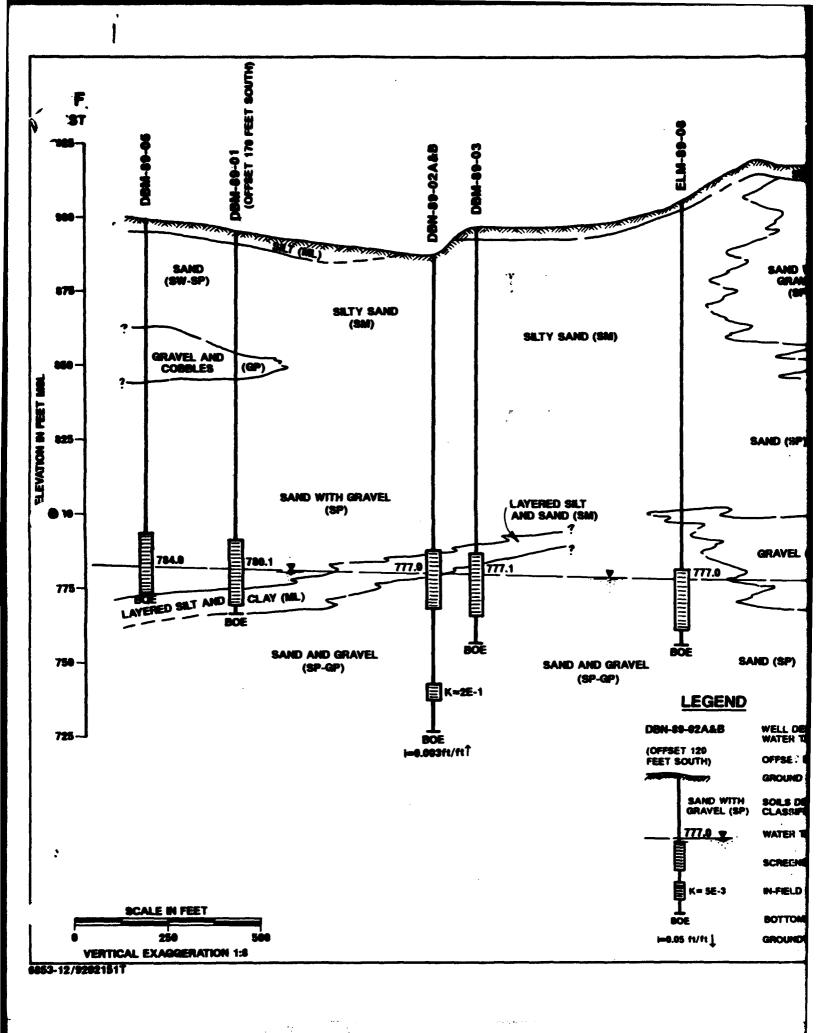
FIGURE 7-8
GEOLOGIC CROSS SECTION D-D'
DETERRENT BURNING GROUND AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

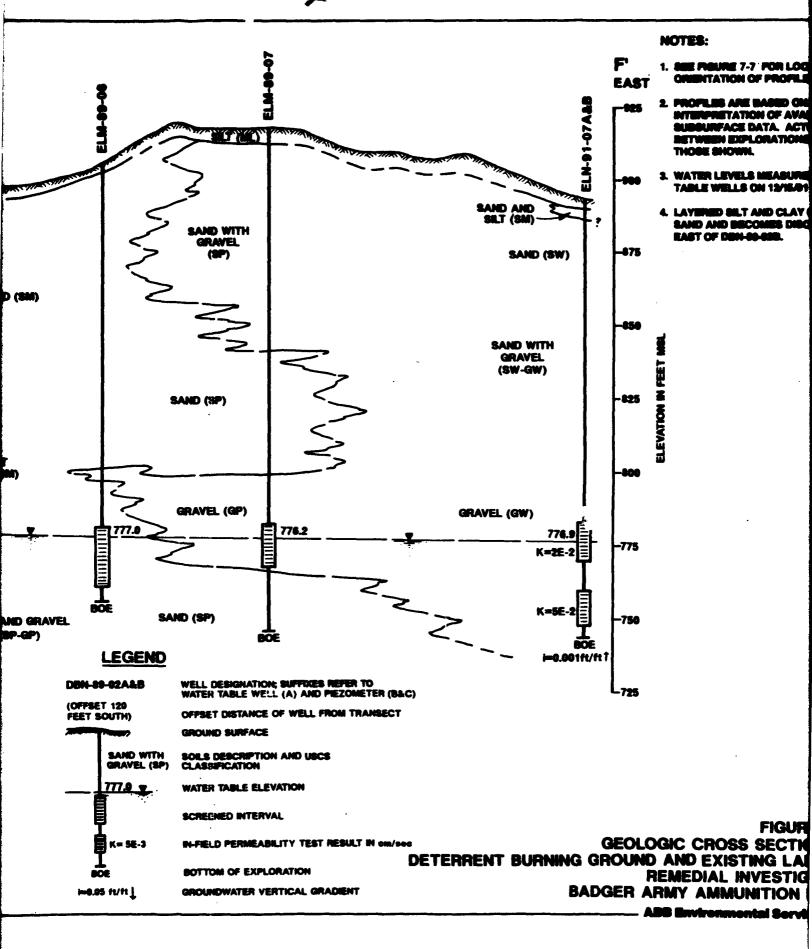
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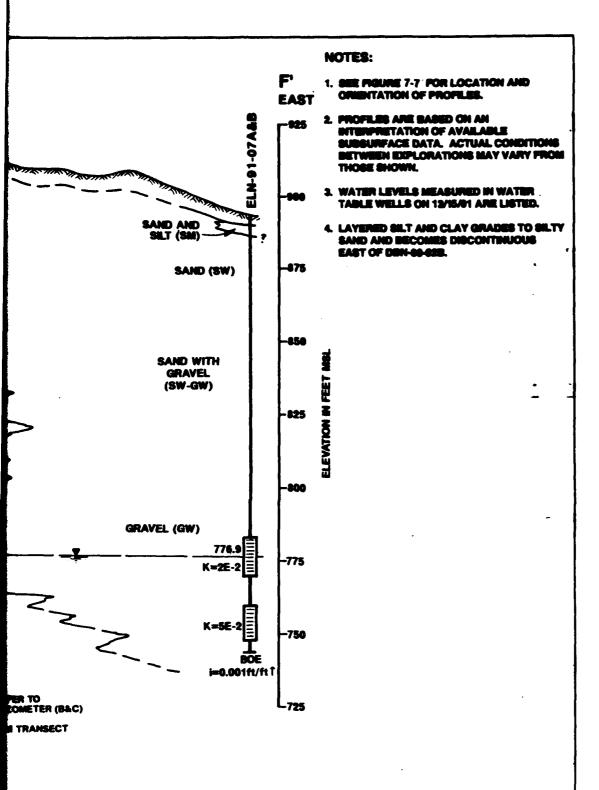
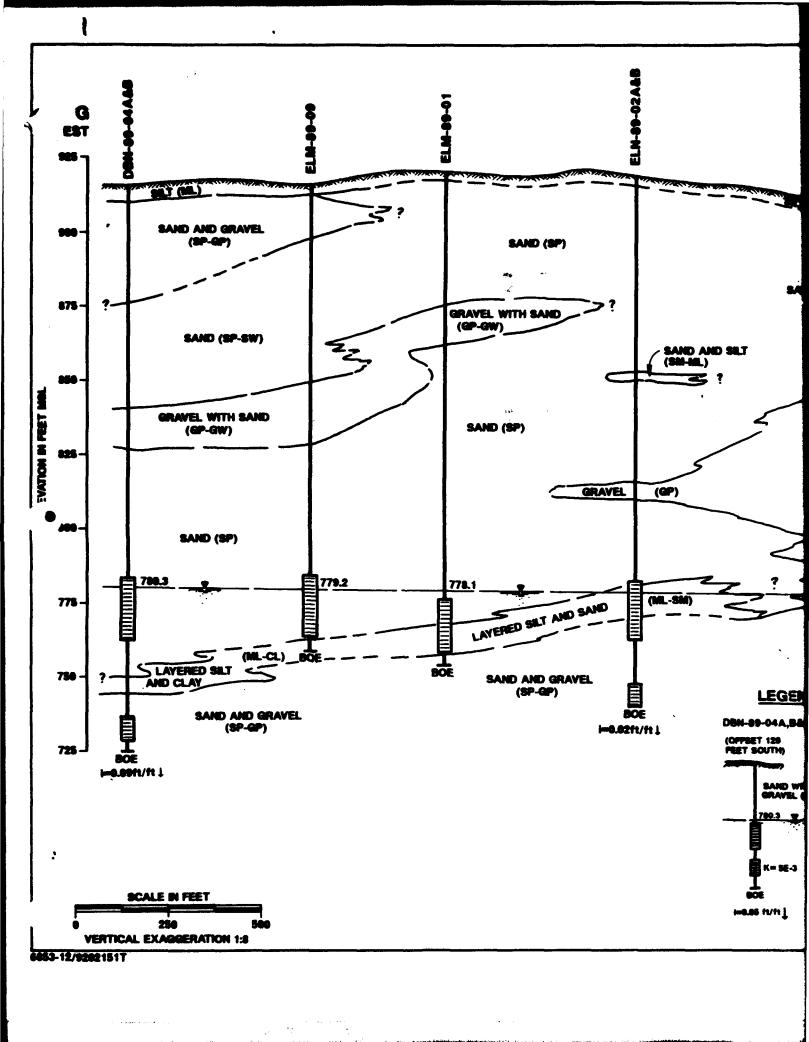
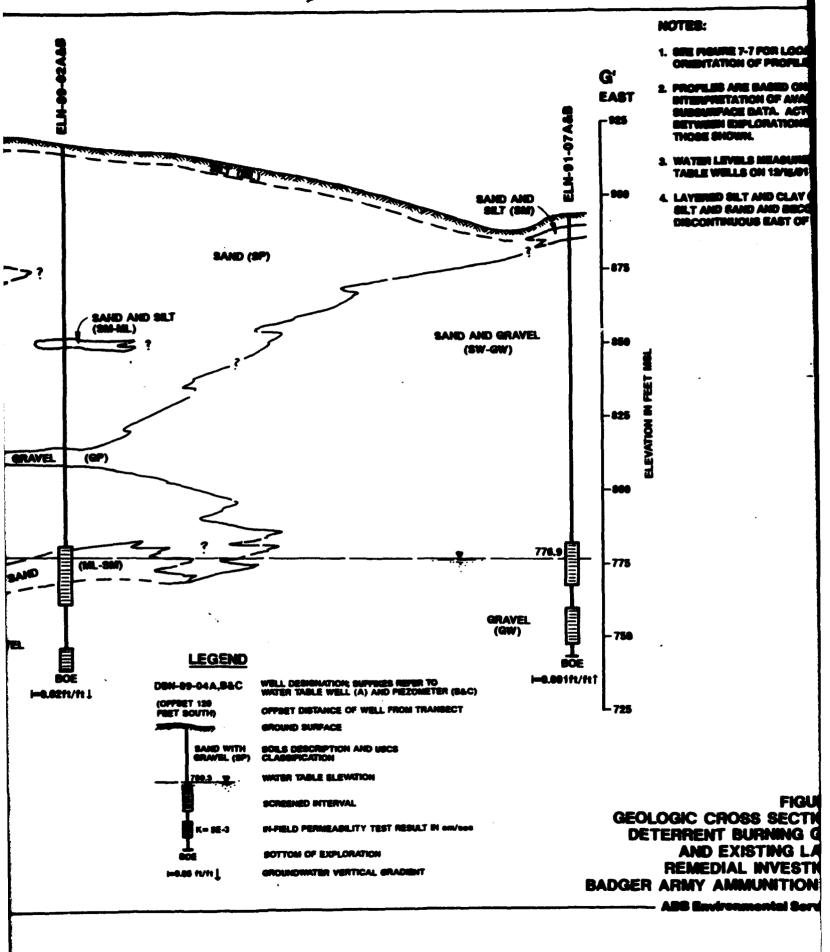


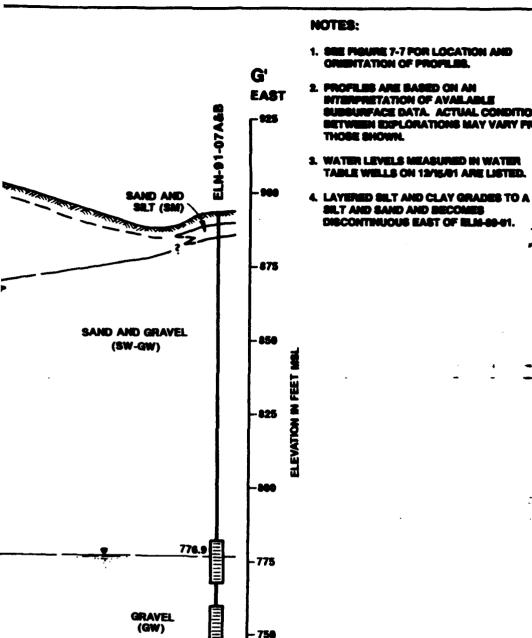
FIGURE 7-10
BULT IN CON/OPPO DETERRENT BURNING GROUND AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

- ABB Environmental Services, Inc.





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BOE i=0.001ft/ft†

725

- 2. PROFILIS ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN
- TABLE WELLS ON 12/15/01 ARE LISTED.

UND USCS

HON

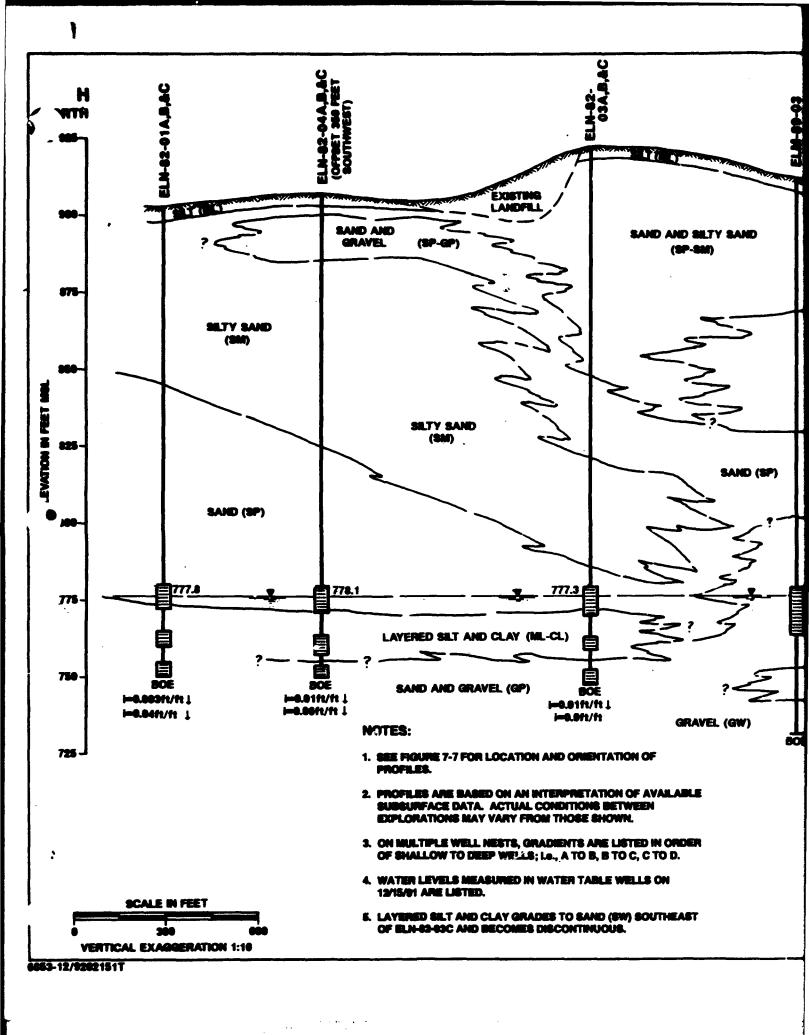
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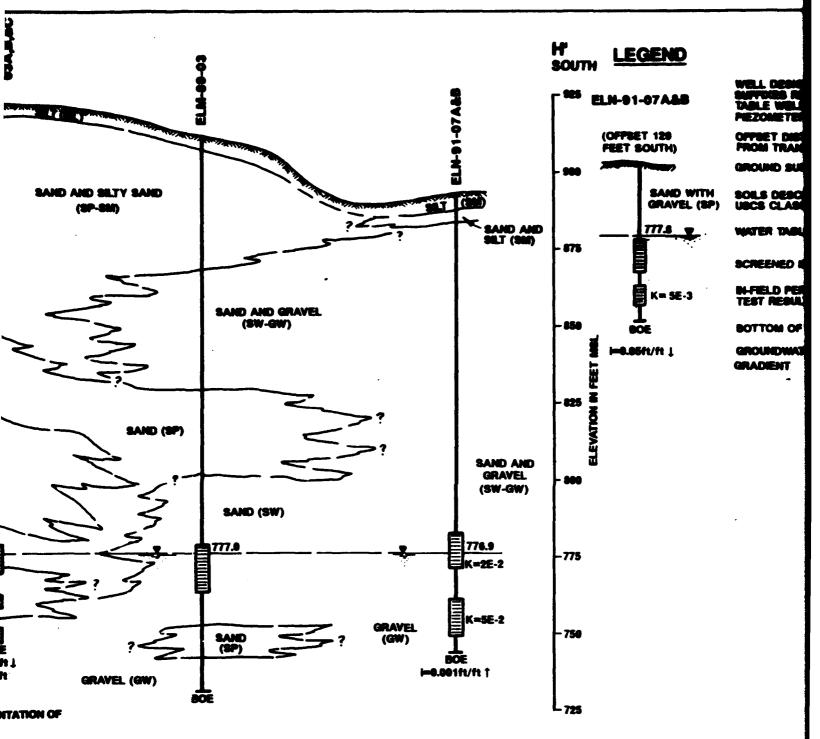
IMPRICES REFER TO (A) AND PREZOMETER (BAC) **WELL FROM TRANSECT**

ICAL GRADIENT

FIGURE 7-11 **GEOLOGIC CROSS SECTION G-G' DETERRENT BURNING GROUND** AND EXISTING LANDFILL REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

ABS Environmental Services, Inc.





ATION OF AVAILABLE B SETWEEN SHOWN.

RE LISTED IN ORDER I, IS TO C, C TO D.

NE WELLS ON

ED (SW) SOUTHEAST LIOUS. FIGURE
GEOLOGIC CROSS SECTIO
DETERRENT BURNING GR
AND EXISTING LAN
REMEDIAL INVESTIGE
BADGER ARMUNITION F

- ABS Environmental Service



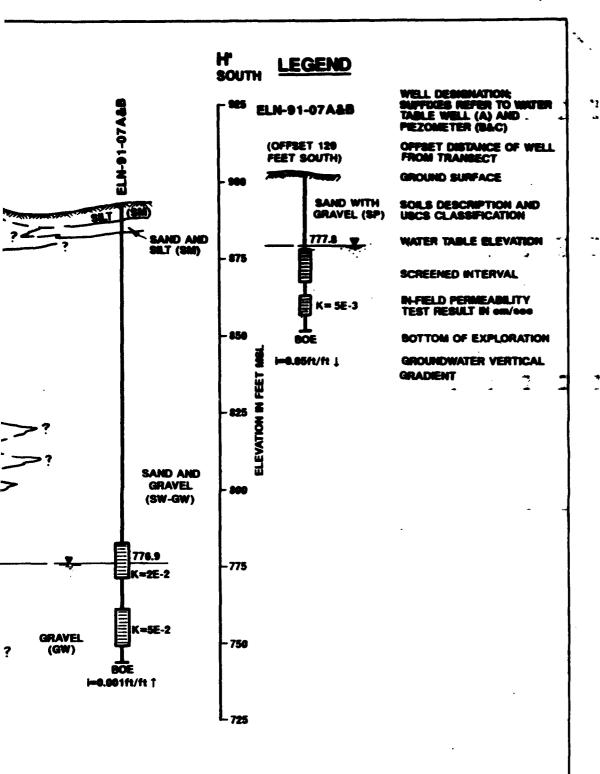
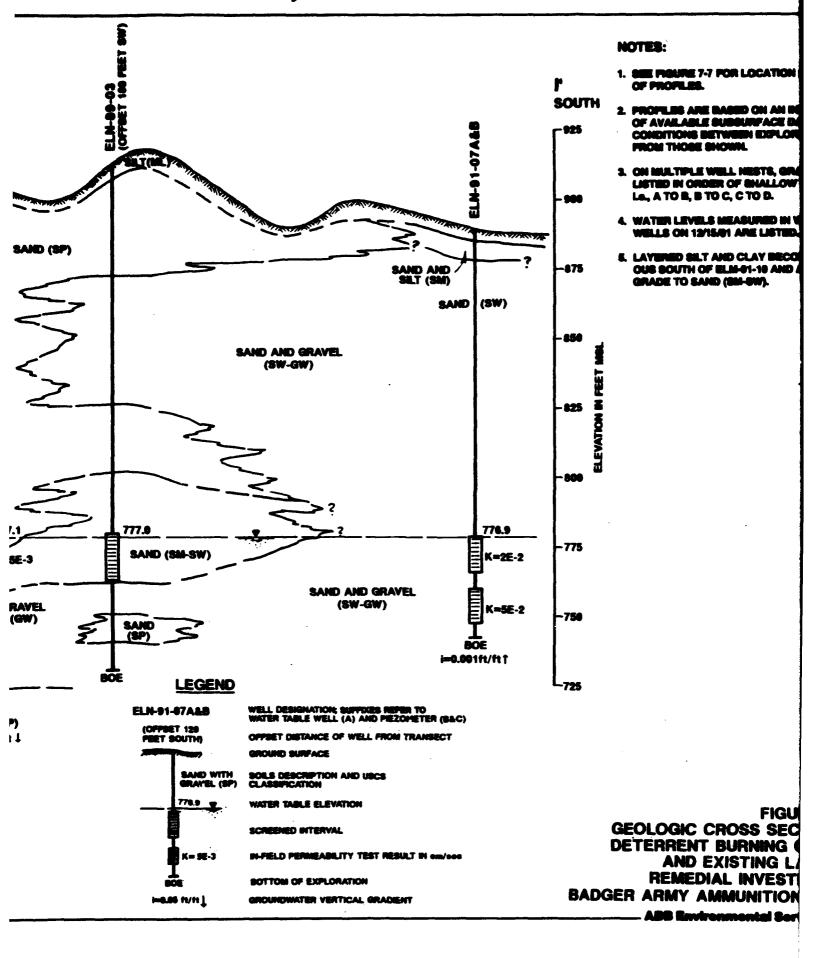


FIGURE 7-12
GEOLOGIC CROSS SECTION H-H'
DETERRENT BURNING GROUND
AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

- ABB Environmental Services, Inc.





SOUTH

925

-875

850

825

200

775

ELEVATION

- 1. SEE FIGURE 7-7 FOR LOCATION AND ORIENTATION OF PROFILES.
- 2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
- 3. ON MULTIPLE WELL NESTS, GRADIENTS ARE LISTED IN ORDER OF SHALLOW TO DEEP WELLS; Lo., A TO B, B TO C, C TO D.
- 4. WATER LEVELS MEASURED IN WATER TABLE WELLS ON 12/15/01 ARE LISTED.
- LAYERED SILT AND CLAY BECOMES DISCONTINU-OUS SOUTH OF ELM-91-10 AND APPEARS TO GRADE TO SAND (SM-SW).

; SUFFIXES REFER TO . (A) AND PIEZOMETER (B&C)

SAND AND SILT (SM)

SAND

(SW)

776.9

K=2E-2

K=5E-2

BOE i=0.001ft/ft↑

OF WELL FROM TRANSECT

) AND GRAVEL (SW-GW)

I AND USCS

MOITA

IL.

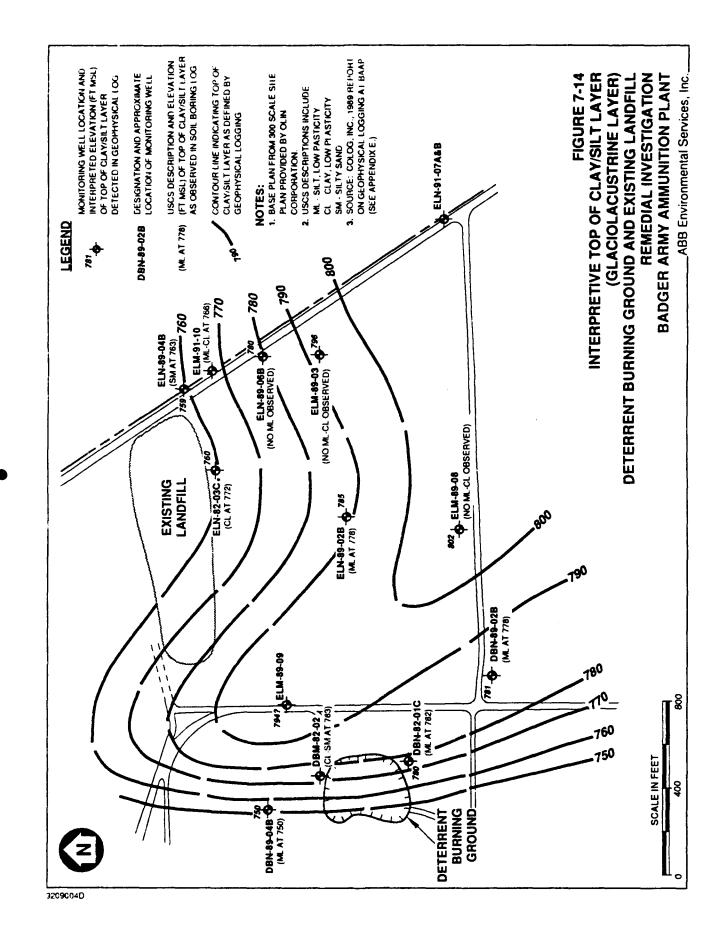
LITY TEST RESULT IN cm/see

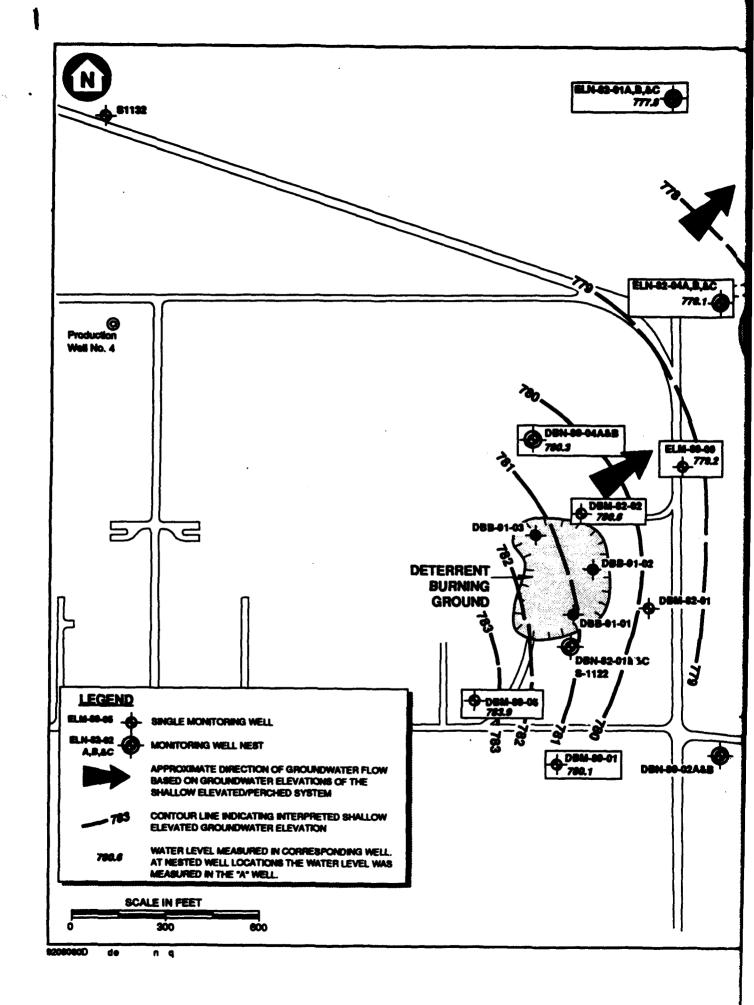
RATION

ITICAL GRADIENT

FIGURE 7-13
GEOLOGIC CROSS SECTION I-I'
DETERRENT BURNING GROUND
AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

ABS Environmental Services, Inc.





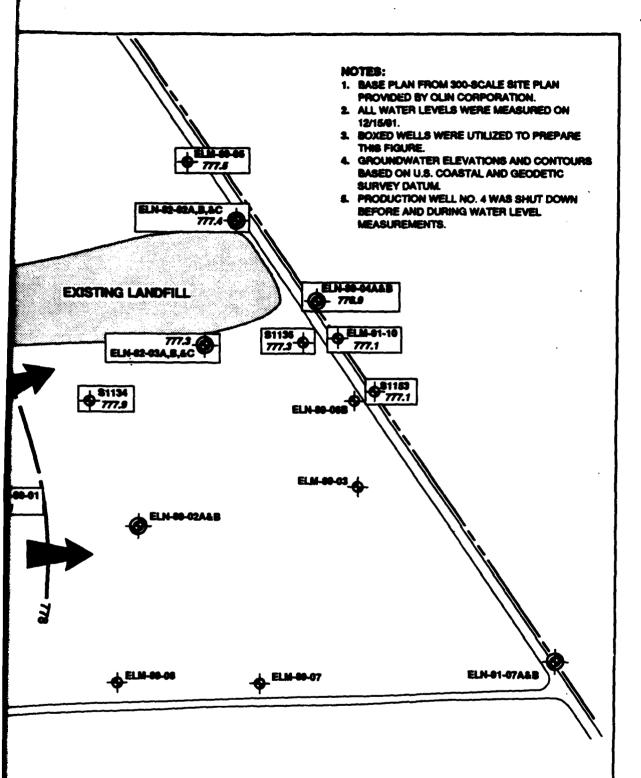
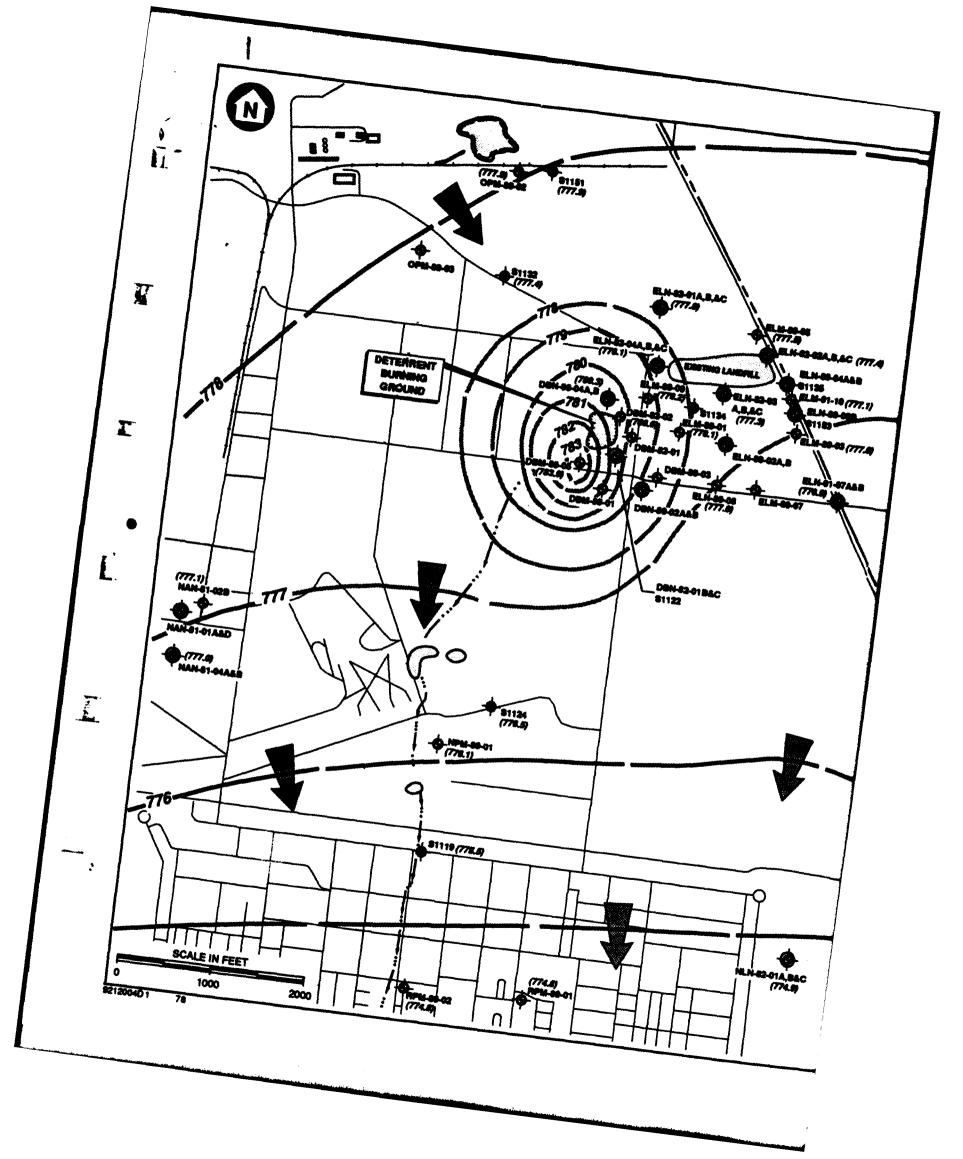
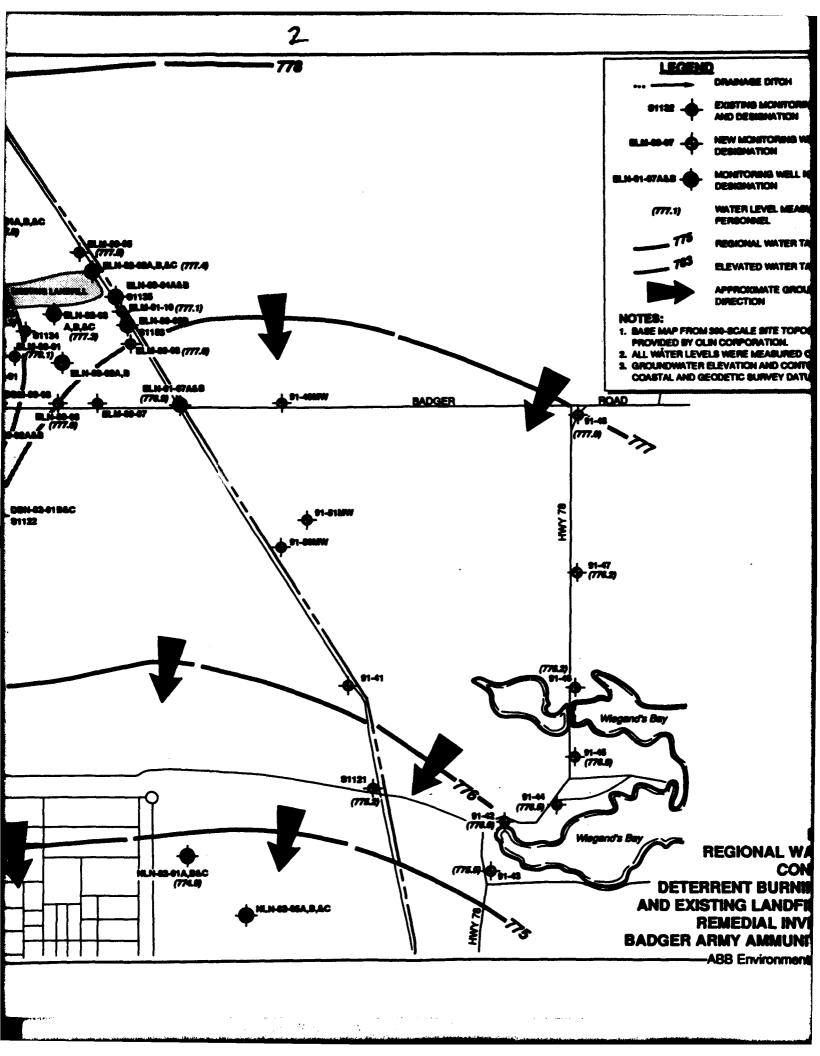
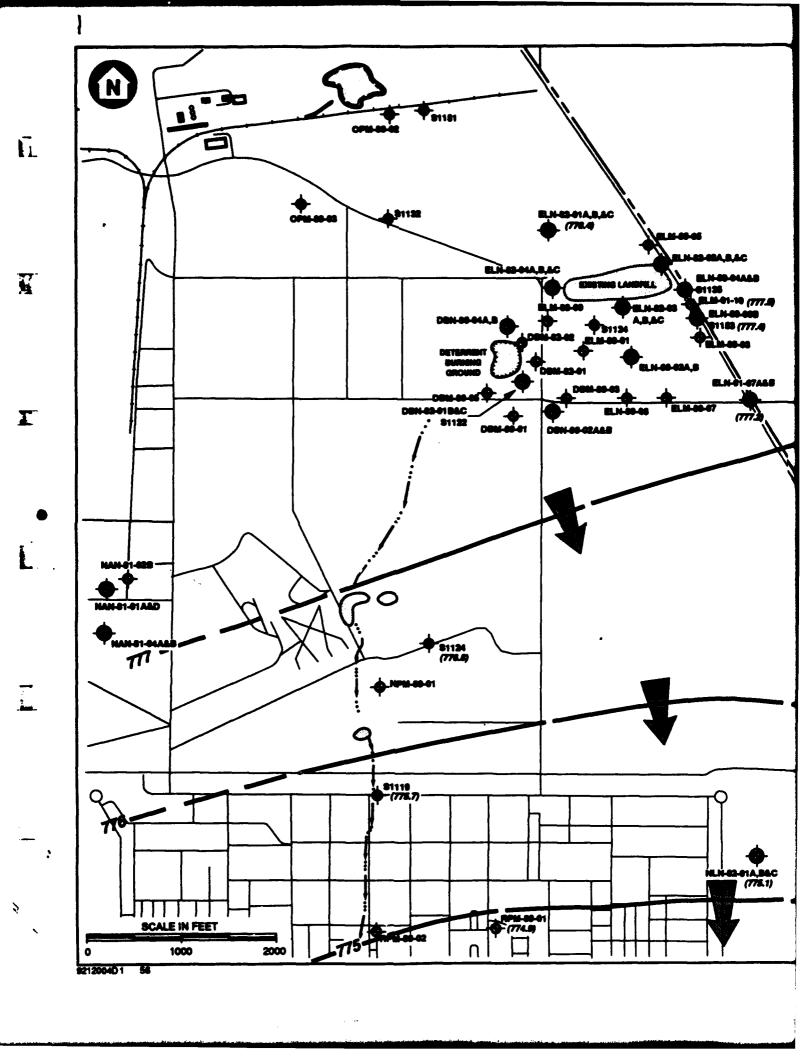


FIGURE 7-15
ELEVATED WATER TABLE CONTOUR PLAN
DETERRENT BURNING GROUND AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

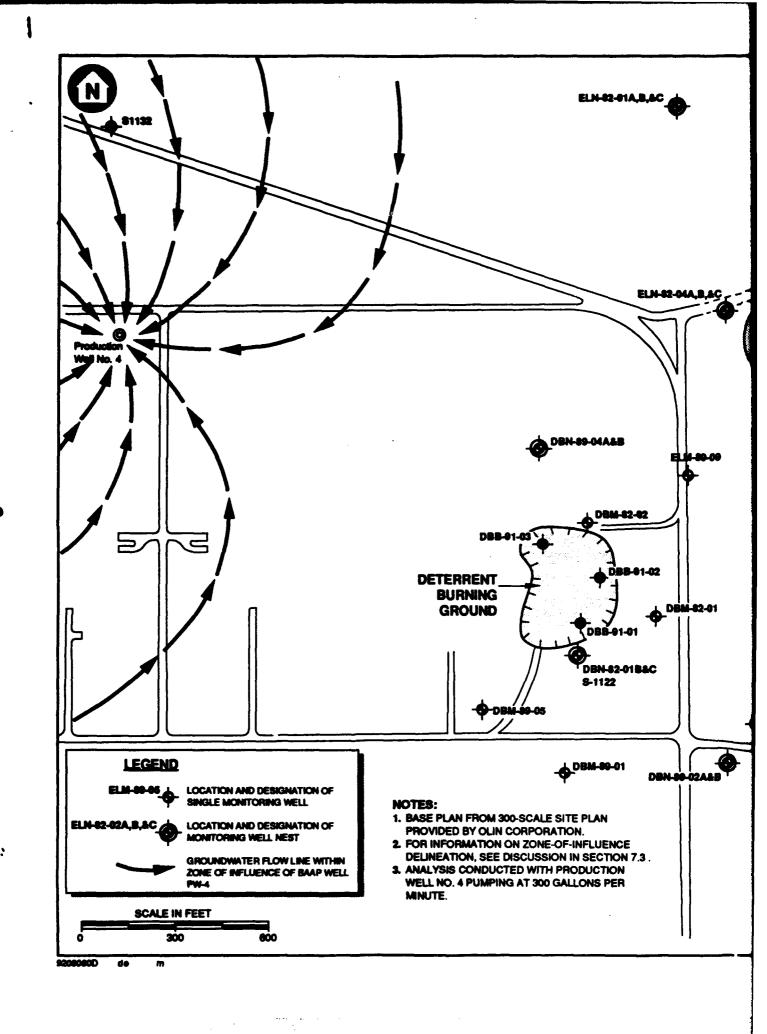
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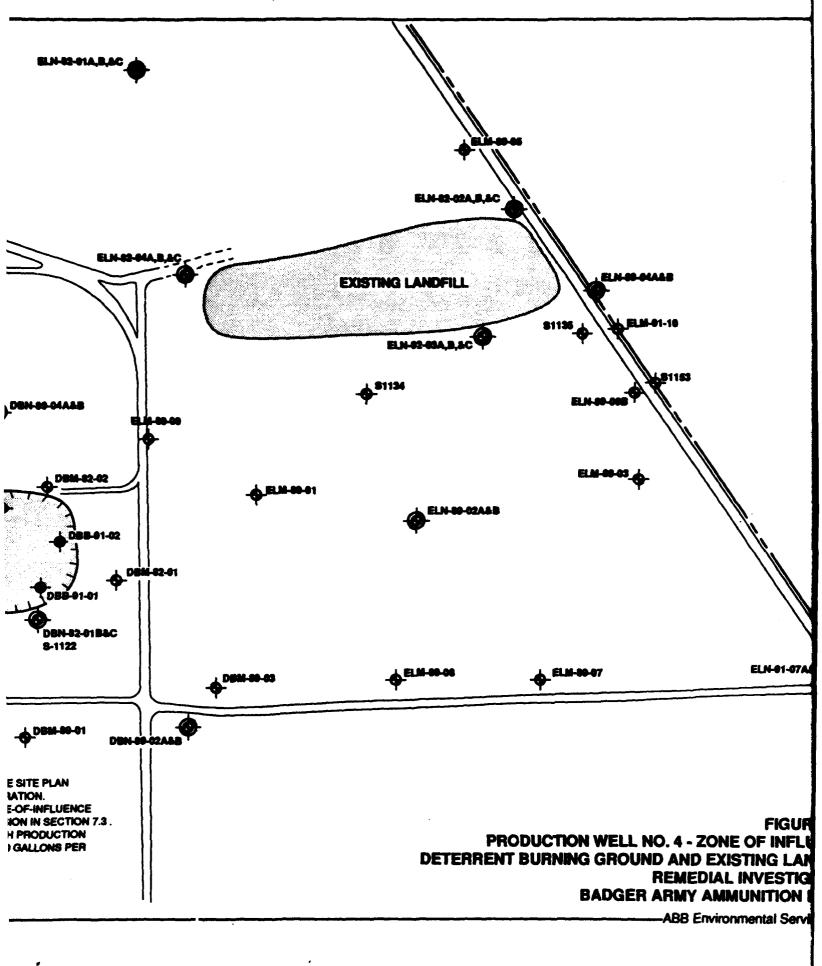


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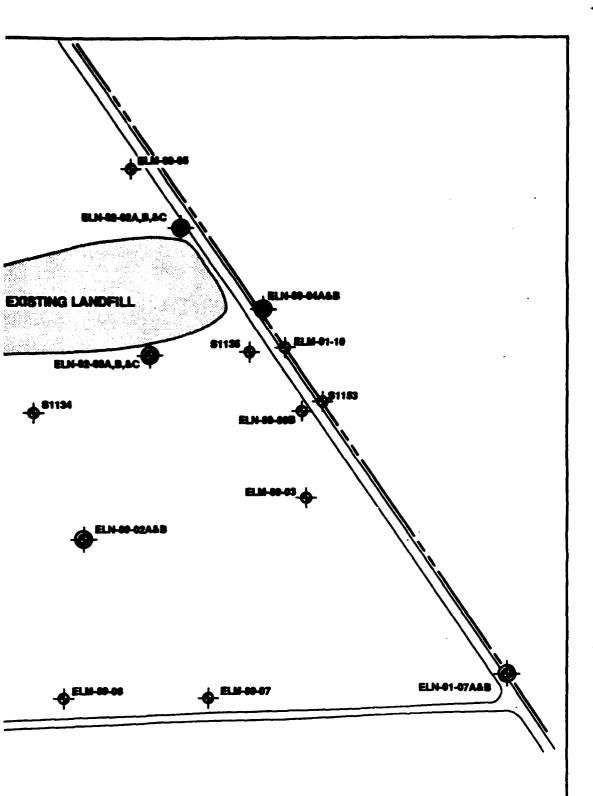
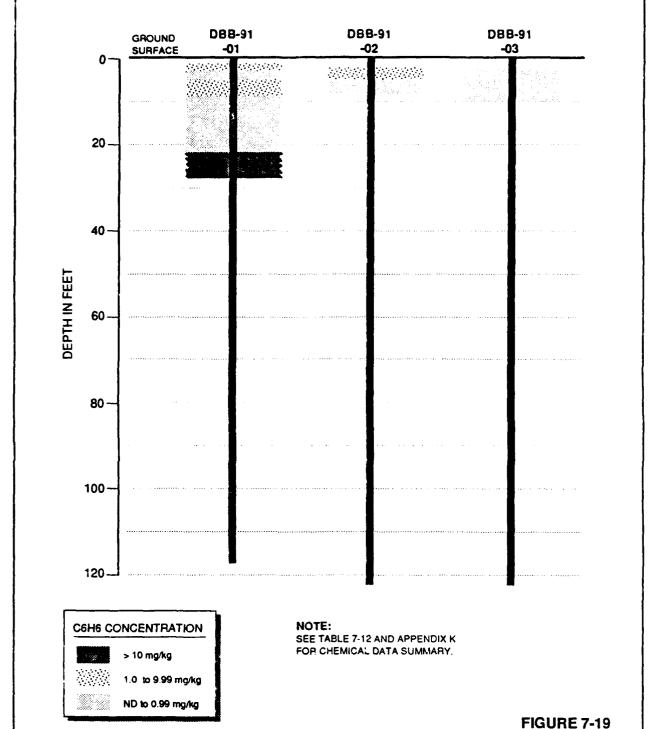


FIGURE 7-18
PRODUCTION WELL NO. 4 - ZONE OF INFLUENCE
DETERRENT BURNING GROUND AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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TOTAL C6H6 CONCENTRATIONS IN
SUBSURFACE SOILS
DETERRENT BURNING GROUND WASTE PITS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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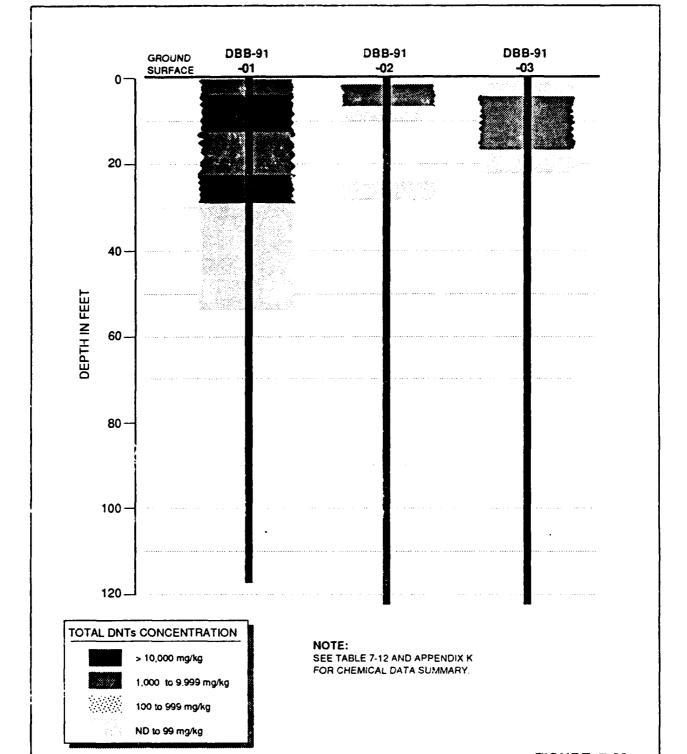
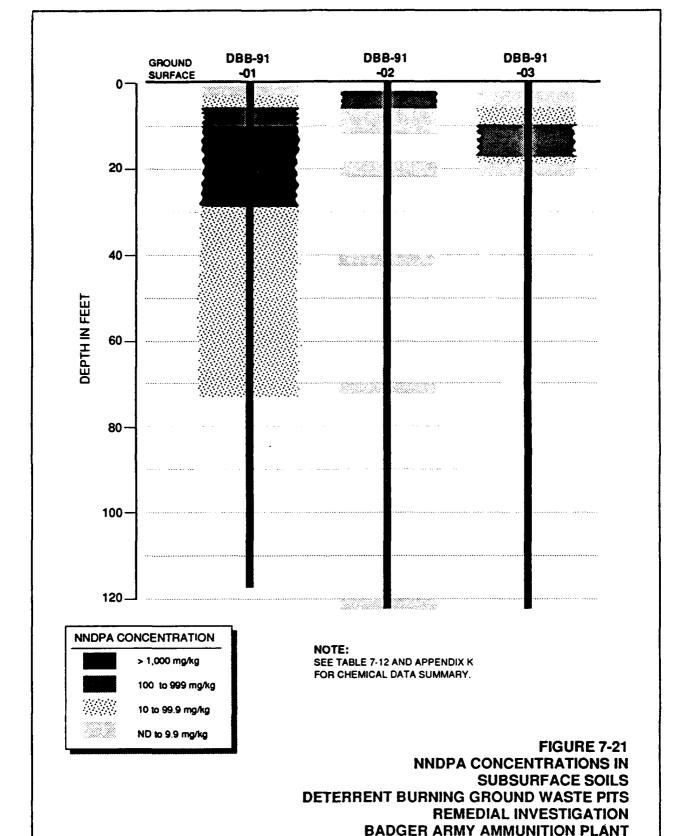
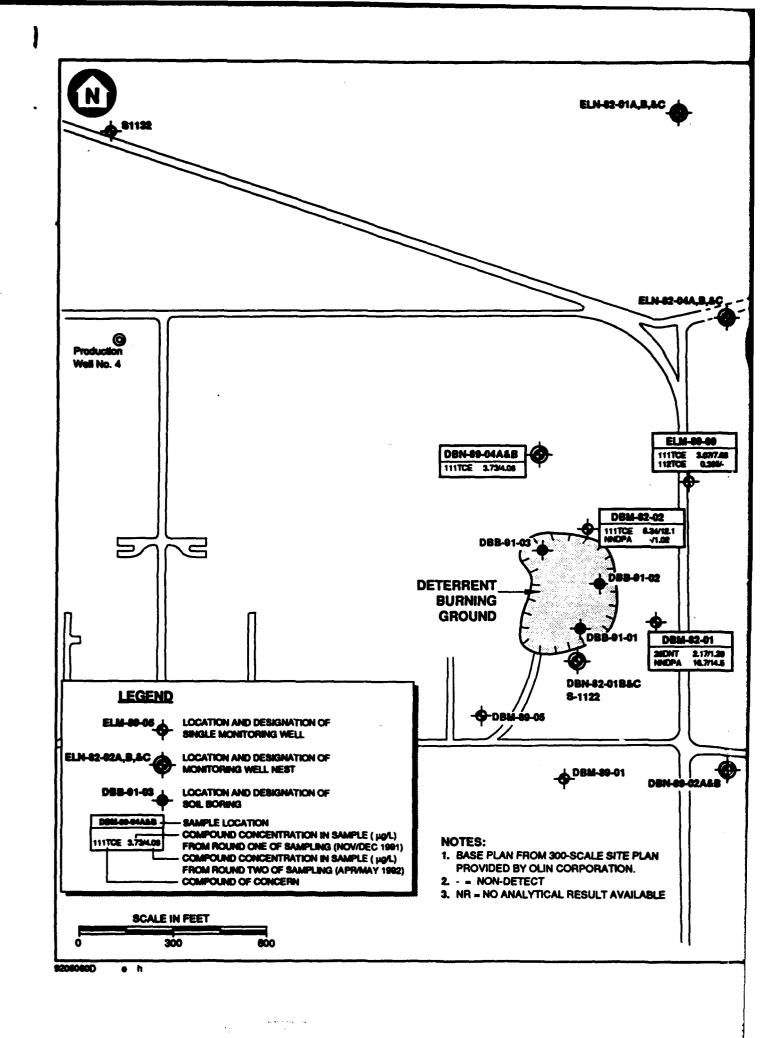
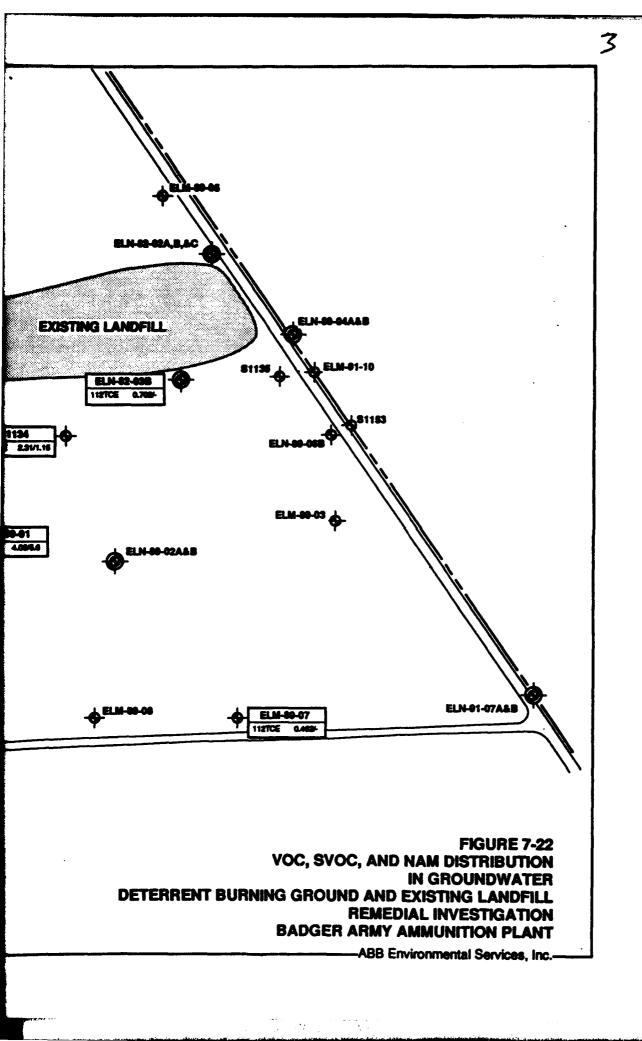


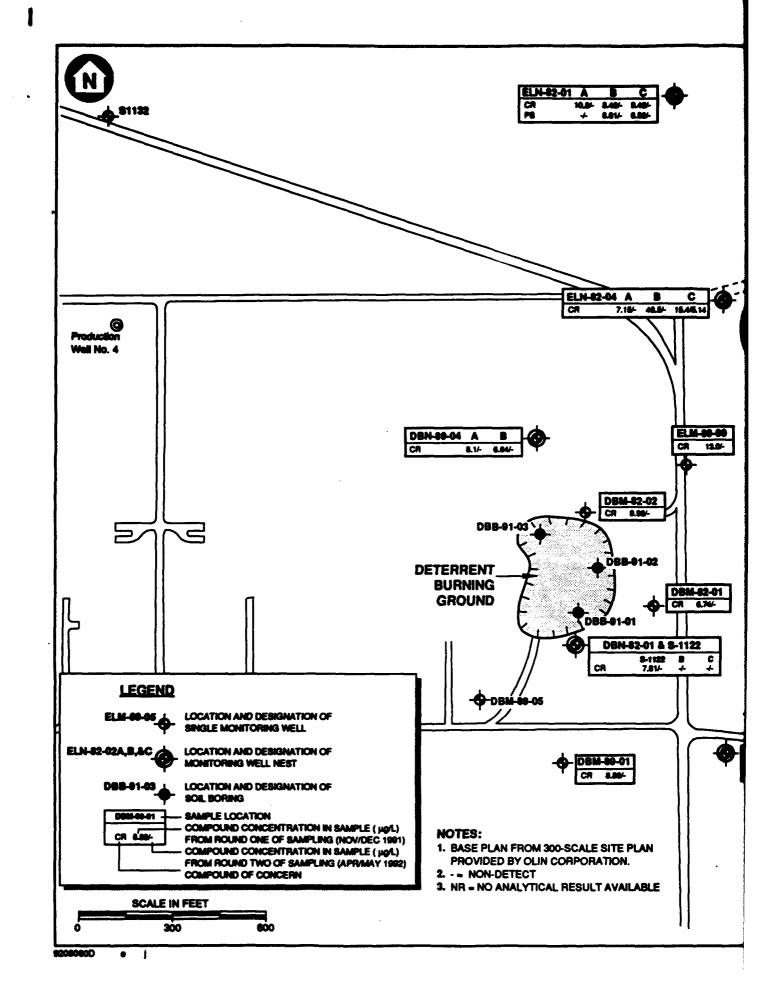
FIGURE 7-20
TOTAL DNTs CONCENTRATIONS IN SUBSURFACE SOILS
DETERRENT BURNING GROUND WASTE PITS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT



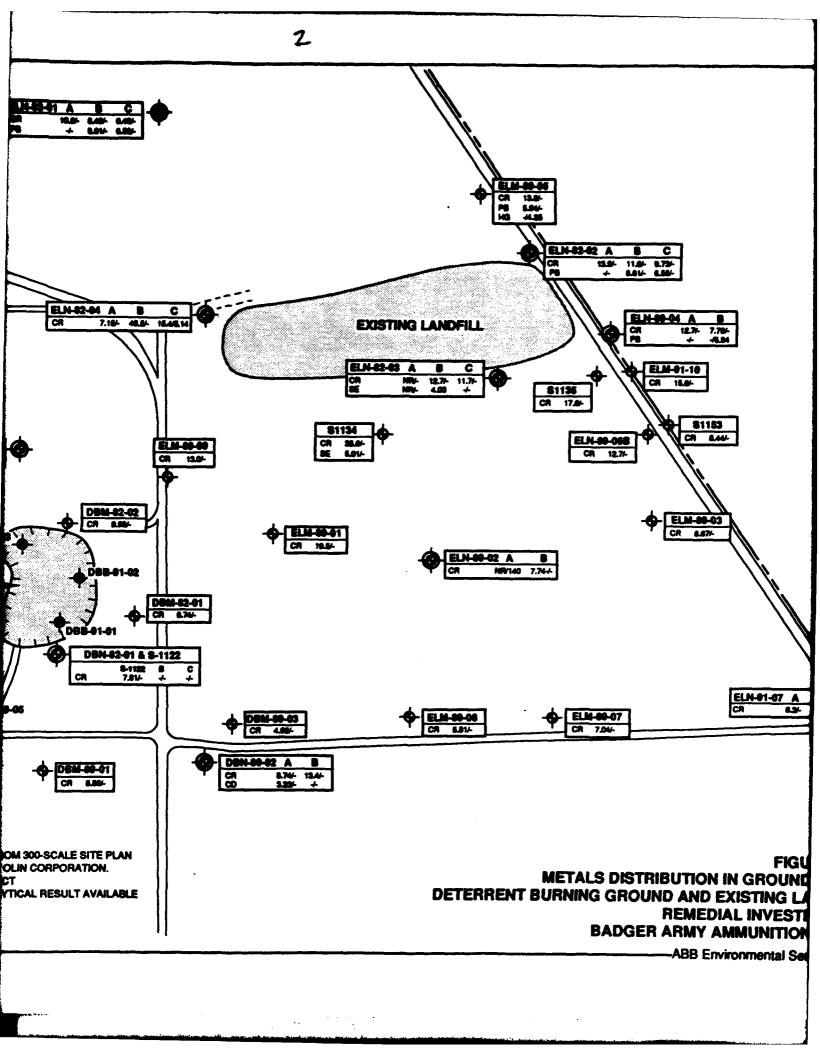


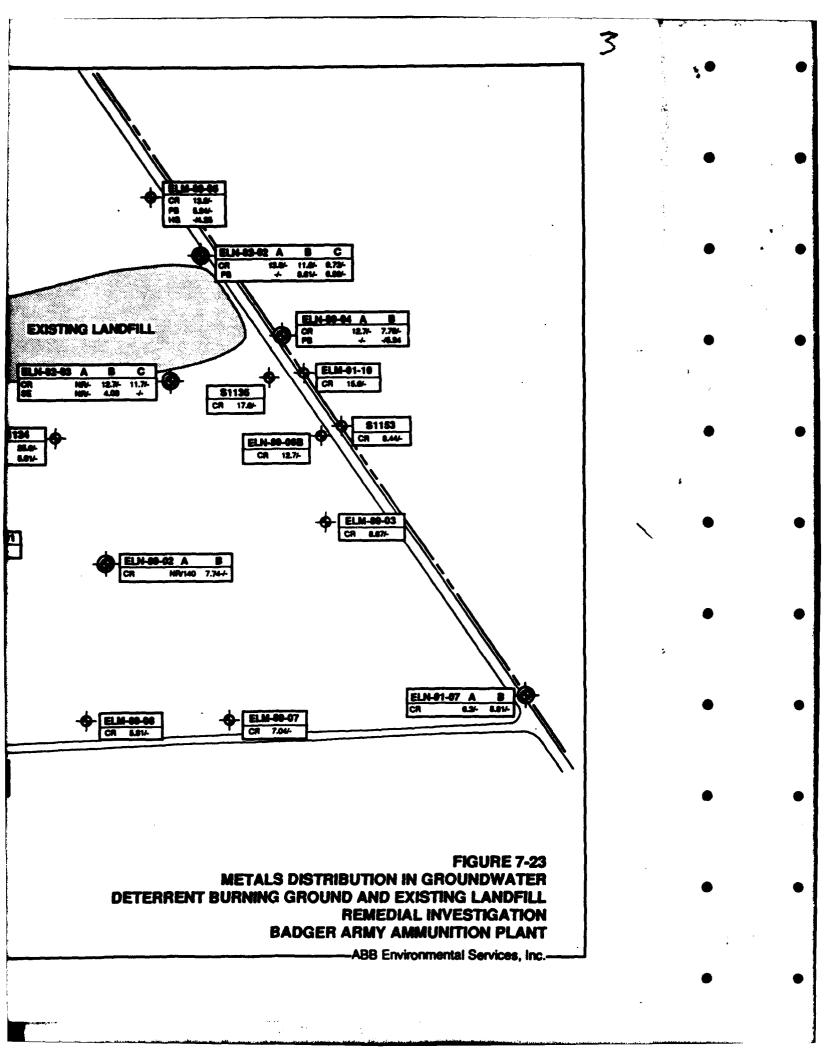
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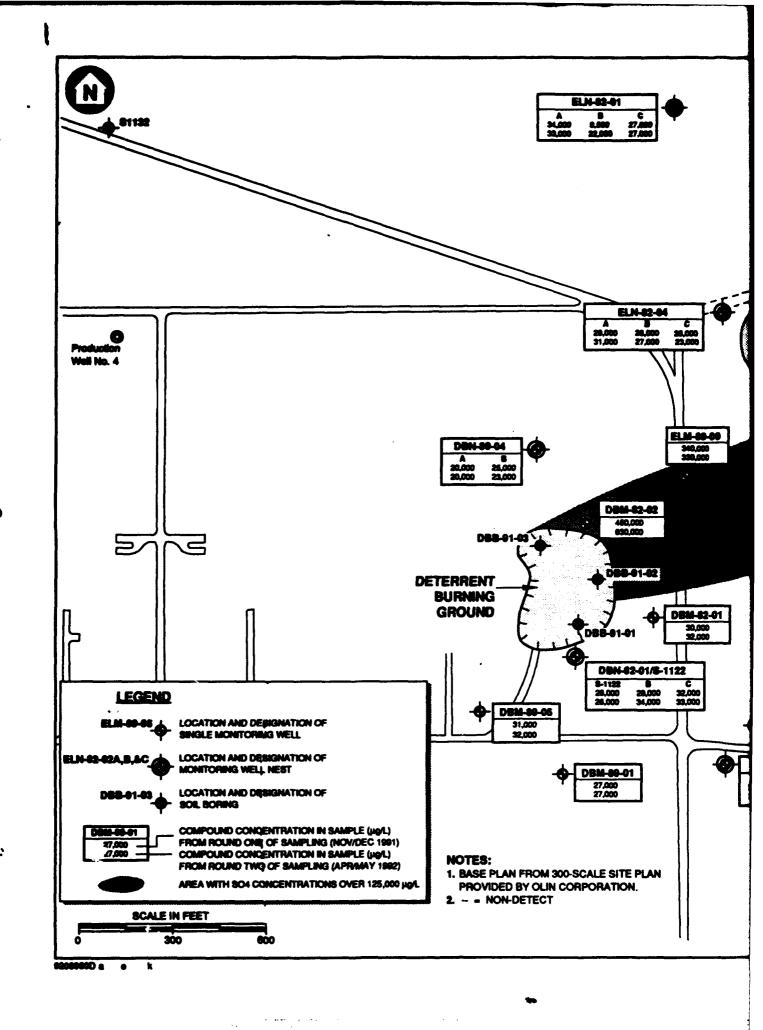




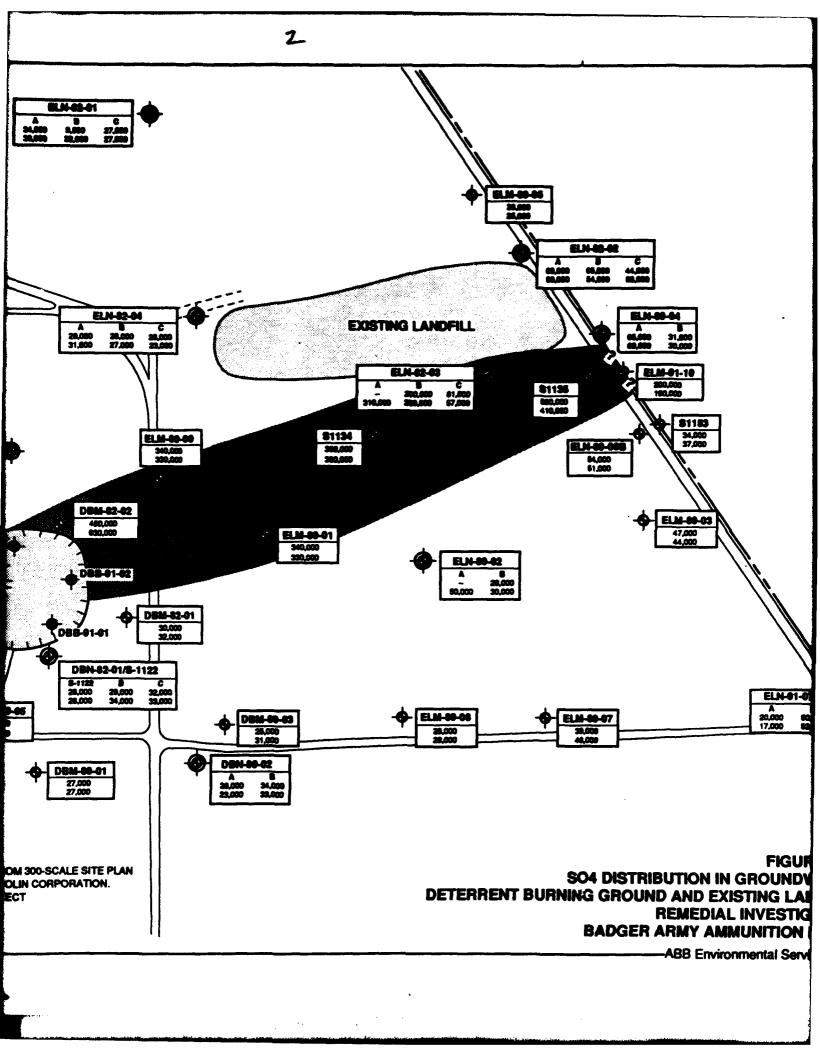
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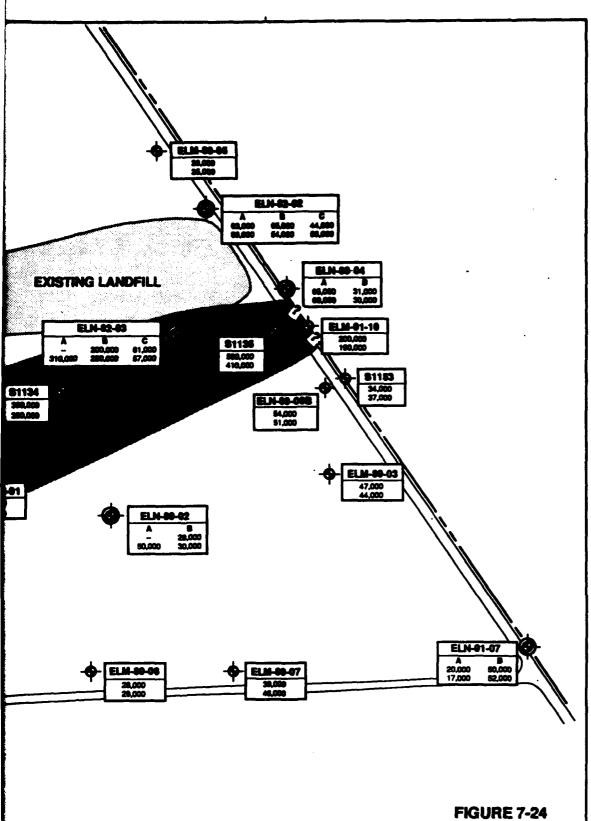






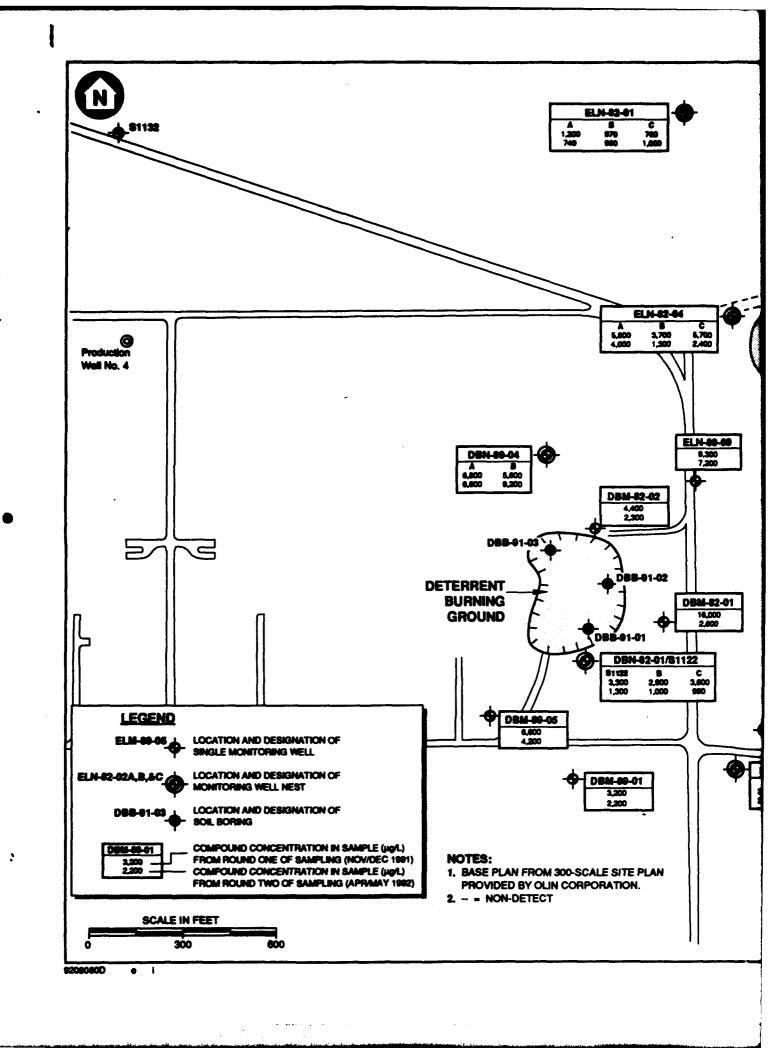
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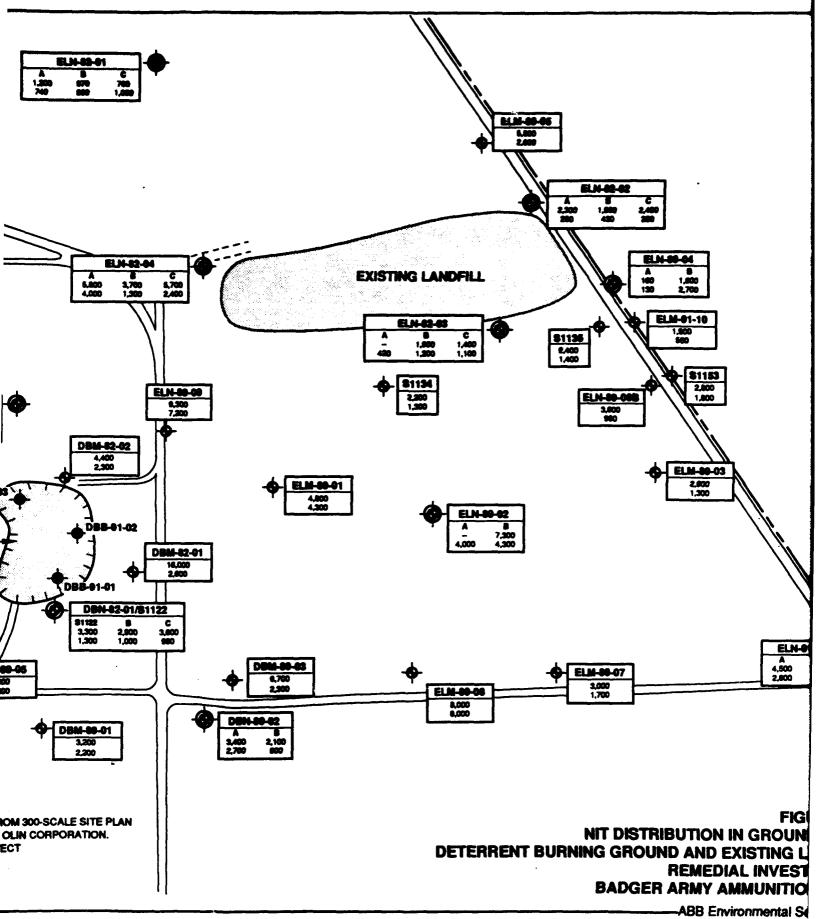
SO4 DISTRIBUTION IN GROUNDWATER
DETERRENT BURNING GROUND AND EXISTING LANDFILL
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.-



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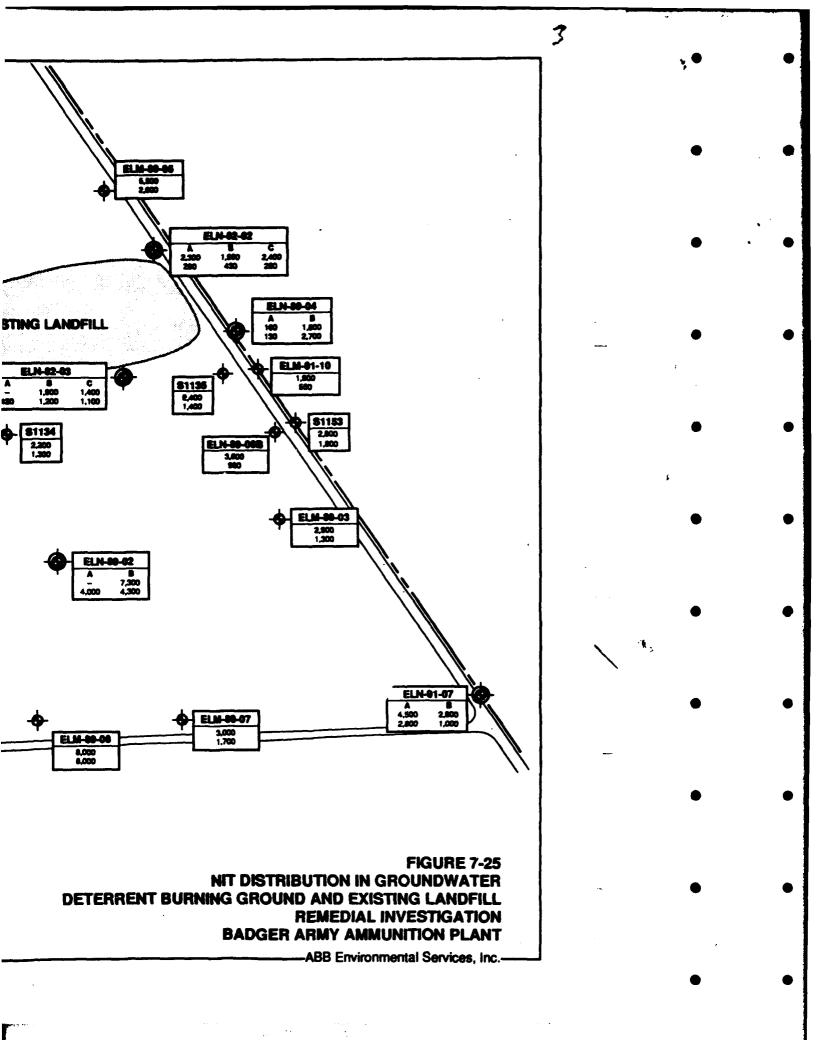


TABLE 8-1 HISTORY OF ACID SPILLS NEW ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SPILL DATE	CAUSE	MATERIAL	AMOUNT (TONS)	CONTROL
4/79	Tank leakage	Oleum	47	Diked, neutralized
6/81	Tank overflow	Sulfuric acid	0.4	Diked, neutralized
9/81	Tank seal failure	Nitric acid	0.5	Diked, neutralized
10/81	Tank car leakage	Nitrous acid	7.8	Diked, neutralized
6/82	Tank overflow	sturic acid	27	Diked, neutralized
6/82	Tank leakage	Nitric acid	<4	Diked, neutralized
10/82	Tank leakage	Sulfuric acid	0.4	Diked neutralized
11/84	Pipe failure	Mixed acids	185	Recovered, diked, neutralized

Source: Tsai et al., 1988.

TABLE 8-2 SUMMARY OF THE REMEDIAL INVESTIGATION FIELD PROGRAM -NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

			PROGRAM ELEMENTS	ç	
SITES	SOIL VAPOR SURVEY	REMOTE SENSING GEOPHYSICS	MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING	SOIL BORINGS AND SOIL SAMPLING	SEDIMENT, SURFACE SOIL, AND SURFACE WATER SAMPLING
Nitroglycerine Pond and Rockel Paste Area	:	:	4 new wells; 20 samples from 4 new and 6 existing wells	1	70 surface soil samples 8 sediment samples 4 surface water samples
New Acid Area	*	:	6 samples from existing wells	•	

Notes:

^{*} Includes 2 rounds of groundwater sampling

TABLE 8-3
SUMMARY OF MONITORING WELLS INSTALLED NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

SITE AND WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	PURPOSE
Nitroglycerine Pond	Pond					
NPM-89-01	Drill through casing hammer	111	762.5	20	Downgradient and 700 feet south of the Nitroglycerine Pond and the Batch Nitroglycerine Area.	To provide horizontal definition of any potential plumes from the Nitroglycerine Pond and the Batch Nitroglycerine Area.
Rocket Paste Area	Area					
RPM-89-01	Drill through casing hammer	127	761.9	20	Adjacent to the Rocket Area drainage ditch and downgradient of the Rocket Paste Pond.	To characterize water quality at the water table downgradient of the Rocket Paste Pond and adjacent to the Rocket Paste Area drainage ditch.
RPM-89-02	Drill through casing hammer	115	761.2	20	Downgradient and southeast of the Rocket Paste Pond.	To characterize groundwater quality and elevation down-gradient and southeast of the Rocket Paste Pond.
RPM-91-01	Dual-wall driven casing	110	766.0	10	Downgradient and east of the Rocket Paste Area.	To assess groundwater quality downgradient of the east Rocket Paste Area.

TABLE 8-4 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
RPM-89-01 ¹	1.3	2x10 ⁻¹	Medium to coarse sand and medium to coarse gravel (SP-GP)
RPM-89-02	1.7	1x10 ⁻¹	Fine to coarse sand with little gravel (SP)

Notes:

Hydraulic Conductivity Tests completed during March and November, 1989, and November and December 1991.

Field data and calculations are presented in Appendix I.

Values for hydraulic conductivities represent an averaged value of multiple tests performed on each well.

Water level recovery at these wells impacted by inertial effects, resulting in water level recovery above static water levels. Hydraulic conductivity measurements may be greater than the calculated values at these wells.

cm/sec = centimeters per second

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TABLE 8-5
WELLS INCLUDED IN GROUNDWATER SAMPLING PROGRAM NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

SITES	NEW WELLS	EXISTING WELLS
Nitroglycerine Pond and Rocket	RPM-89-01	\$1118
Paste Area	RPM-89-02	\$1119
	RPM-91-01	S1120
	NPM-89-01	\$1124
		S1125
		\$1150
Subtotal	4	6
New Acid Area		NAN-81-01A
		NAN-81-02B
		NAN-81-03B,C
		NAN-81-04B,C
Subtotal	0	6
Magazine Area		\$1115
		S1116
Subtotal	0	2
Southeastern/Eastern Boundary		S1110
·		\$1111
		\$1112
ļ.		\$1113
		S1114
		S1121
Subtotal	0	6
TOTAL WELLS	4	20

TABLE 8-6
CHEMICAL ANALYSES PERFORMED ON SURFACE SOIL AND SEDMENT SAMPLES NITROGLYCERINE POND/ ROCKET PASTE AREA NEW ACID AREA

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TABLE 4-6
CHEMICAL ANALYSES PERFORMED ON SURFACE SON. AND SEDMENT SAMPLES MTROGLYGENINE POND! ROCKET PASTE AREA NEW ACID AREA

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CHEMICAL ANALYSES PERFORMED ON SURFACE SOIL AND SEDMENT SAMPLES -NITROBLYCERINE PONDY ROCKET PASTE AREA NEW ACID AREA TABLE 1-6

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PP = Priorky Poliutent Metale (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, 8B, SE, TL, ZN)
TAL = Toxic Analyte List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCMS
GCMS = Gae ChromatographyMass Spectrometry

BN/A = base-neutral and acid-extractable ciganics by GCMS

NAM = nitroeamines by GC DNT = 2.4- and 2.6-dinitrutoluene by HPLC HPLC = High Performance Liquid Chromatrography

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CHEMICAL ANALYBES PERFORMED ON SURFACE WATER SAMPLES NITROGLYCERINE POND/ROCKET PASTE POND TABLE 6-7

BADGER ARMY AMMUNITION PLANT **NEMEDIAL INVESTIGATION**

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NPW-01-02	-	-	-	-	-	-	-	-	-	-	-	-
ROCKET PASTE POND												
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RPW-91-02	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	•	•	•	*	•	•	•	÷	•	•	•	4

NOTES:

BNVA = base-neutral and sold-extractable organics by GCMS

DNT = 2.4- and 2.6-dinitrotoluene by HPLC

GCM8 = Gae ChromatographyMass Spectrometry HPLC = High Performance Liquid Chromatrography

NAM - witrosemines by GC

N2KJEL - Nitrogen by Kjeldehl Method

PP = Priority Poliutant Metale (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, 8B, SE, TL, ZN)
TAL = Tonic Analye List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = voletile organic compounds by GCAMS

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TABLE 8-6
CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES NITROGLYCERINE POND/ HOCKET PASTE AREA NEW ACID AREA

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CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES -NITROGLYCERINE PONDY ROCKET PASTE AREA NEW ACID AREA TABLE 8-4

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PP = Pricarty Poliutent Metals (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN) TAL = Toxic Ansiye List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GC/MS

GCMS = Gas ChromatographyMass Spectrometry BN/A = base-neutral and acid-extractable organics by GCMS

NAM = nttrosemines by GC

DNT = 2,4- and 2,6-dinitrotoluene by HPLC

HPLC = High Performance Liquid Chromatrography

(1) AG was not analyzed for in Round Two.

B = Analyzed in Both Rounds (One and Two). 2 = Analyzed in Round Two Only.

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TABLE 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		NPS91-01	NPS-91-02	NPS-91-03	NPS-91-04	NPS-91-05	NPS-91-06	NPS-91-07	NPS-91-08	NPS-91-09	NPS-91-10
Sample Type:	ä	POND	POND	POND	POND	POND	POND	POND	POND	POND	POND
UNITS		OOO	ngg	000	ngg	nee	ngg	nec	000	000	000
DATE SAMPLED:	IPLED:	09/20/91	09/20/91	09/22/91	16/27/60	09/22/91	09/22/91	09/22/91	09/22/91	16/02/60	16/07/60
DEPTH		0.000	0.000	0.000	0.000	0.000	0000	0.000	0000	0000	0.000
SVOC	123PDA										
	24DNT										
	Z6DNT										
	BZEHP										
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	DEP										
	FANT										
	NG	ı	1	1	ı	1	1	,	1	9.390	15.800
	NNDMEA										
	NNDNPA										
	NNDPA										
	PHANTR										
	PYR					!					
Metals	CR	40.500	30.900	30.600	16.300	4.900	20.700	7.000	28.900	39.500	32.100
	HG	12.000	20.000	14.000	3.500	0.159	5.100	0.752	14.000	2.400	ı
i	P.B	410.000	110.000	270.000	140.000	32.000	190.000	\$8.000	240.000	2000,000	10000,000
Anions	HIN										
1	\$0 4						i				
Indicator	CHN	3.870	6.850	72.500	15.100	2.280	66.700	6.110	22.900	17.700	4.470
parameter											

TABLE \$~9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site 1D:		RPS-91-01	RPS-91-02	RPS-91-03	RPS-91-04	RPS-91-05	RPS-91-06	RPS-91-07	RPS-91-06	RPS-91-09	RPS-91-10
Sample Type:		DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DICH	DICH	DTCH
UNITS		000	000	090	UGG	nee	050	000	000	nge	000
DATE SAMPLED:	Ë	09/20/91	09/20/91	16/11/60	16/11/60	09/17/91	16/11/60	16/11/60	16/11/60	16/11/60	16/11/60
DEPTH		0000	0.000	0000	0000	0.000	0.000	0000	0000	0000	0000
SVOCE	123PDA										
	24DNT	•	ı	ı	1	ı	ı	•	•	ı	,
	26DNT	1	ı	,	1	ı	ı	1	1	1	!
	ВЗЕНР	ł	1	1	•	1	ı	•	•	•	,
	BAANTR	ı	1	1	•	ı	1	•	•	ł	ı
	BBFANT	ı	1	•	ł	ı	•	ı	•	ı	•
	BGHIPY	1	ı	•	ı	ı	ı	ı	t	ı	1
	CHRY	1	1	ı	1	1	ı	1	1	0.090	t
	DEP	ı	2.460	ı	•	ı	1.780	6.200 GT	•	6.200 GT	0.6.1
	FANT	ı	1	1	1	ı	•	ı	ł	090'0	ı
•	NG	1.760	ı	,	ı	0.729	1	1.630	ı	3.280	1.220
	NNDMEA	ı	1	ı	•	ı	t	1	1	1	1
	NNDNPA	,	•	ı	•	ı	1	ı	ı	•	í
	NNDPA	4.980	0.738	ı	ı	0.245	0.355	0.976	0.199	1.740	0.768
	PHANTR	1	ı	1	ı	ı	1	•	1	1	ı
	PYR	•	1	1		•	•	•	ı	•	
Metals	CR	45.700	33.800	4.410	17.400	17.800	15.400	6.220	15.300	13.100	11.800
	HG	0.157	0.080	ı	I	ı	ı	1	1	i	í
	88	2600.000	1100.000	470.000	3500.000	24.000	110.000	120.000	9.500	120.000	14.300
Anions	TIN	2.220	1.960	2.350	4.150	4.860	5.300	3.290	955.9	4.480	3,180
	SO4	150.000	210.000	6.280	10.200	•		ı	6.810	-	1
Indicator	NH3										
Parameter											;

TABI.E 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		RPS-91-11	RPS-91-12	RPS-91-13	RPS-91-14	RPS-91-15	RPS-91-16	RPS-91-17	RPS-91-18	RPS-91-19	RPS-91-20
Sample Type:	**	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	ртсн
UNITS		ngg	nec	ngg	000	000	ngg	000	000	000	nge
DATE SAMPLED:	PLED:	16/11/60	16/11/60	16/11/60	16/11/60	09/17/91	09/17/91	09/18/91	09/18/91	16/11/60	16/81/60
DEPTIL		0.000	0.000	0.000	0.000	0.000	0000	0000	0.000	0000	0.000
SVOC	123PDA										
	24DNT	I	24.100	6.200 GT	9.230	ı	ı	1	ı	ŧ	1
	26DNT	1	2.120	1.250	6.360	1	ı	ı	1	i	1
	BZEHP	1.560	1	ı	1	ı	ı	ı	ı	1	1
	BAANTR	1	ı	•	1	•	ı	•	ı	1	t
	BBFANT	1	1	ı	ı	1	ı	ı	1	1	ı
	BGHIPY		ı	1	ı	i	ı	1	ł	i	,
	CHRY	ŧ	ı	0.305	0.322	ı	1	1	1	1	1
_	DEP	6.200 GT	6.200 GT	6.200 GT	5.880	2.980	ŧ	7.550	6.200 GT	1	6.200 GT
	FANT	ı	1	0.235	0.323	1	4	0.048	0.091	1	ı
	NG	9.570	130.000	290.000	3.870	1	4.770	ı	15.900	i	2.330
	NNDMEA	ı	1	•	ı	ı	1	1	i	1	1
	NNDNPA	ı	ı	1	1	1	ı	1	ı	ı	1
	NNDPA	47.000	260.000	450.000	49.000	2.090	1.940	0.121	0.375	0.538	0.101
	PHANTR	,	ı	0.115	0.279	ı	1	1	0.097	1	ı
	PYR	ŧ	ı	0.252	0.380		1	•	1	1	. 1
Metals	CR	21.400	12.600	38.700	23.300	15.400	13.700	21.600	19.200	27.800	11.600
	HG	1	1	0.067	0.067	0.560	0.054	1	0.069	1	•
	PB	1100.000	19.000	170.000	\$8.000	15.300	190.000	110.000	1400.000	16.000	130.000
Anions	LIN	9.030	3.200	9.410	6.670	6.250	1.360	5.530	6.340	3.700	1 090
;	\$04	1	ŧ į	•	1	•	,	7.670	ſ	8.370	17 100
Indicator	NH3										
paiameter											

TABLE 8-9
SUMMARY OF SURFACE SOIL AND SEDIMEN'I CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

er. B		RPS-01-21	RPS-91-22	RPS-01-23	RPS-01-24	RPC-01-74	N P S - 01 - 24	R PS_01_27	RPS-01-28	BPS-01- 20	DP - VI
1		DICH	איזנע	Heard	DICH	DICH	DICH	מזכת	וויטדעו	D.T.C.	1,714
Sample 1ype.			210			חכוו	DICH	מומ		מוכונו	
SIEIS		000	990 0	000	000	990	nee	nge	000	nge	graci Graci
DATE SAMPLED:	PLED:	09/18/91	09/18/91	16/81/60	16/81/60	16/18/60	09/18/91	09/18/91	09/18/91	09/18/91	16.91 10
DEPUIL		000.0	0.000	0000	0000	0000	0.000	0.000	0.000	0.000	0000
SVOKA	123PDA										
	24DNT	•	3	1	i	ı	i	1	i	1	
	26DNT	ı	1		ı	ı	1	ı	1	ı	
	BZEHP	1.610	1	ŧ	;	1	ı	1	ı	,	
	BAANIR	1	1	1	1	ı	1	ı	1	į	i
-	BBFANT	1	ı	1	•	ı	ı	ı	1	ı	i
	BGHIPY	•	ı	ł	ı	1	ŧ	ı	•	J	
	CHRY	1	1	i	1	0.189	ı	t	ı	0.147	,
	DEP	1	ı	6.200 GT	6.200 GT	6.200 GT	ı	6.200 GT	6.29	5.250	133 CH2 0
	FANT	ı	ı	0.155	ſ	0.179	I	1	1	0.111	0.008
	NG	1	ı	4.840	2.390	3.870	12.100	1.700	0.873	5.820	ı
	NNDMEA	ı	ı	ı	f	ı	ı	1	ı	ı	ı
-1	NNDNPA	1	1	1	1	1	1	ı	ı	J	
	NNDPA	1	ı	3.470	2.480	1.700	ı	36.000	0.167	1.960	2.550
	PHANTR	1	ı	960.0	0.129	0.119	ı	ı		J	0.036
	PYR	1	1	0.223	•	0.221	,	ı	1	0.179	:
Metals	CR	9.920	3.410	20.600	19.600	13.800	6.470	6.620	0.999	16.500	12,400
	HG	ı	1	1	f	1	ı	ι	1	ı	
	PB	64.000	15.000	380.000	180.000	130.000	22.000	54.000	12.000	00.011	730.000
Anions	TIN	2.000	2.200	3.580	8.540	5,380	1.690	4.130	1	4.130	2.950
	SO4	1	1	7.520	11.600	11.000	1	-	i	i	ı
Indicator	CIIN										
Peranicier											

Notes and flagging codes are presented at the end of this table.

TABLE 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHFMICAL DATANITROGLYCERINE POND/ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-											;
Sic E		RPS-91 11	RPS-91-31	RPS-91-32	RPS-91-32	RPS-91-33	RPS-91-33	RPS-91-34	RPS-91-34	RPS-91-35	RPS-91 - 35
Sample lype:		DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	EDICH
UMIIS		ngg	NGG	neg	990	nge	UGG	NGG	000	กดด	Control
DATE SAMPLED:	PLED:	16/81/60	09,18/91	09/18/91	16/18/01	09/18/91	09/18/91	09/18/91	19/18/91	09/18/91	16/18/10
UPPILL		0.000	0.500	0.000	0.700	0.000	00.500	0.000	0.300	0.000	0.50
7,70,73	A Claret							3 000 01	3 000 01		
	TNOW		i					13:000 5	6 000.71		
	TNGAC	. 1	į l	,	1 1	s	1	i	ı	•	:
	I N/Te7	1	ı	•	ı	•	ł	•	ı	ı	i
	BZEHP	1	ı	i	ı	ſ	•	1	•	1	•
	BAANTR	ı	ı	ı	ı	ı	ı	0.173	1	Ì	ı
	BBFANT	1	ı	1	1	t	ı	ı		•	ı
	BGHIPY	ı	1	1	1	t	ı	ı	•	1	ı
	CHRY	•	1	1	1	ı	1	1	ı	1	í
	DEP	6.200 GT	49.800 S	6.200 GT	47.100 S	0.652	ı	6.200 GT	4.980 S	2.050	2.110 S
	FANT	ı	ı	0.052	ı	,	ı	0.159		•	1
	NG	27.900		48.500		1.250		26.100		1.700	
	NNDMEA	1	ì	ı	ı	ł	ŧ	0.040	1	1	ſ
	NNDNPA	ŀ	1	ı	1	,	ı	ı	ı	ı	ı
	NNDPA	1.780	ı	3,700	ı	1	1	81.000	ı	2.460	1
	PHANTR	ŧ	ı	0.102	1	1	1	0.111	1	ı	1
	PYR	•	1		1	1	ı	1	•	ł	
Metals	CR.	6.590		14.700		14.600		31.600		005'99	!
	HG	1		•		ı		1		ì	
	82	45.000		120.000		12.600		75.000		150.000	ļ
Autons	ī	5.380		2.240		2.440		3.780		3.040	
	\$0 4	1				,		1		1	
Indicator	NII3										
perameter											i

TABI E 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHFMICAL DATANITROGLYCERINE POND/ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site 1D:		RPS-91-36	RPS-91-36	RPS-91-37	RPS-91-38	RPS-91-39	RPS-91-40
Sample Type:		DTCH	DTCH	DTCH	DTCH	DTCH	DTCH
UNITS		000	000	000	000	000	000
DATE SAMPLED:	ED:	16/81/60	09/18/91	16/61/60	16/61/60	09/19/91	16/11/60
DEPTIL		0000	0.500	0.000	0.000	0.000	0000
\$VOC.	123PDA		•				
	24DNT	ı	,	•	93.100	33,200	\$60.000
	Z6DNT	1	1	ı	6.200 GT	6.200 GT	23.100
	BZEHP	ı	1	ı		ı	ı
	BAANTR	ı	1	•	ı	ı	0.280
	BRFANT	ı	ı	ı	1	ŀ	2.130
	BGHIPY	•	1	ı	i	ı	ı
	CHRY	1	1	0.211	i	1	0.865
	DEP	ı	t	1	6.200 GT	1.860	ı
	FANT	ı	ı	0.164	ı	t	1.120
	ÜN	1		1	310.000	240.000	1400.000
	NNDMEA	ı	•	ı	0.150	0.022	0.302
	NNDNPA	,	ŧ	1	0.230	960.0	0.226
	NNDPA	0.092	ı	0.429	3.590	900.000	10000.000
	PHANTR	1	1	0.101	0.146	i	•
	PYR	1	ı	0.299	_	t	0.932
Metals	%	12.500		9.000	18.400	15.600	109.000
	HG	ı		ı	0.161	960.0	0.716
	48	8.500		100.000	290.000	260.000	2200.000
Asioss	TIN	4.130		4.170	4.840	3.330	120.000
	804	1		ı	1	ı	7.560
Indicator	NH3						
narameter							

TABLE 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

											1
Site ID:		RPS-91-41	RPS-91-42	RPS-91-43	RPS-91-44	RPS-91-45	RPS-91-46	RPS-91-47	RPS-91-48	RPS-91-49	RPS-91-50
Sample Type:		DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DICH	DTCH	DTCH
UNITS.		ngg	nge	nec	000	000	000	990	990	990	990
DATE SAMPLED:	'LED:	16/61/60	16/61/60	16/61/60	16/61/60	16/61/60	16/61/60	09/19/91	16/61/60	16/61/60	15/61/60
DEPTH		0000	0.000	0.000	0.000	0000	0.000	0.000	0000	0000	0000
SVOC	123PDA										
	24DNT	3.950	ı	ı	1	1	1	•	8.340	3.150	810.000
	26DNT	1	1	ı	1	1	ı	ı	0.790	ı	32.500
	BZEIIP	í	ı	•	ı	ſ	ı	1	t	•	;
	BAANTR	1	1	1	1	1	1	•	ı	ı	
-	BBFANT	ſ	ı	ı	1	ı	ł	1	1	ı	ł
	BGHIPY	1	ı	ì	•	ŧ	ı	ı	:	ı	ı
	CHRY	ı	1	1	1	i	ı	;	ł	ı	i
	DEP	ſ	ı	ı	١	1	ı	1	1.860	0.901	0.200 GT
	FANT	1	ı	1	٠	,	ı	ı	•	ı	0.118
	Ŋ	4.330	1	ı	ı	1	ı	1.120 N	23.300	27.200	1500,000
	NNDMEA	ı	1	1	1	t	ı	•	ı	ı	0.123
	NNDNPA	ı	ı	ı	1	ı	1	ı	ı	1	091.0
	NNDPA	29.000	3.920	1.770	0.345	1.050	1.060	2.950	250.000	120.000	2000,000
	PHANTR	ı	1	1	•	ı	ı	1	ı	i	J. 197
,	PYR	1	1	t	•	e	-	1	1	•	
Metals	CR	12.500	14.600	6.400	24.800	3.730	10.300	13.200	26.000	23.500	39 600
	HG	0.083	1	:	0.055	í	ı	0.061	•	1,00	0 212
!	PB	78.000	21.000	20.000	40.000	160.000	43.000	32.000	32.000	78.000	140 000
Anivas	LIX	7.190	9.110	4.890	7.140	4.960	2.680	12.500	2.660	12.700	6.110
	\$04		1	1	1 1	*		17.800	٠	16.200	
Indicator	NH3										ļ
parameter											,

TABLE 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE FOND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID.		RPS-91-51	RPS-91-52	RPS-91-53	RPS-91-54	RPS-91-55	RPS-91-56	RPS-91-57	RPS-91-58	RPS-91-59	RPS-91-60
Sample Type:		DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH
UNITS		ngg	000	990	UGG	NGG	000	000	000	000	000
DATE SAMPLED:	LED:	16/61/60	16/61/60	16/61/60	16/61/60	09/19/91	16/61/60	16/02/60	16/02/60	16/07/60	09/20/91
DEPTH:		0.000	0.000	0000	0000	0000	0000	0000	0.000	0000	0.000
SVOC	123PDA										
	24DNT	86.300	i	:		ı	•	•	ı	1	ı
··········	26DNT	065.9	ı		•	1	ı	ŀ	ı	•	1
	BZEHP	1	,	ı	ı	•	•	ı	•	1	J
	BAANTR	0.666	I	ı	ı	t	1	,	ì	1	ı
	BBFANT	2.030	i	ı	ı	•	•	ı	1	ı	ı
	BGHIPY	1.910	ı	1	•	1	ı	1	1	i	1
	CHRY	1.000	1	1	•	i	1	•	ı	ı	J
	DEP	2.510	J	i	ı	6.200 GT	1.650	•	•	6.200 GT	ı
	FANT	0.274	ı	ı	1	0.058	0.050	0.059	ı	1	0.083
	ŊĊ	7.550	1.210 N	3.300	9.500	48.200	2.170 N	1.840	•	31.500	2.190
	NNDMEA	0.059	1		ı	1	1	f	ı	0.023	1
	NNDNPA	0.127	ı	ı	1	ı	ı	1	ı	ı	ı
	NNDPA	2400.000	1.350	13.000	240.000	19.000	1.420	0.467	•	3.910	12.000
	PHANTR	0.231	ı	•	ı	0.076	ı	ſ	ı	1	1
!	PYR	0.683	1	1	1	1	•	•	ı	1	• [
Metals	C R	30.800	7.040	7.100	13.800	35.500	19.900	19.300	9.760	16.000	19.900
	НG	0.134	1	0900	1	•	950.0	i	1	0.117	ı
1	PB	490.000	15.000	35.000	29.000	140.000	100.000	\$5.000	40.000	\$2.000	57.000
Aniuns	LIN	7.040	2.730	3.780	9.460	9.000	3.650	3.930	4.730	055"	7.320
	504	6.390	8.020	6.210	1	1	•	6	•	•	1
Indicator	NH3										
parameter											

TABLE 8-9
SUMMARY OF SURFACE SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		RPS-91-61	RPS-91-62	RPS-91-63	RPS-91-64	RPS-91-65	RPS-91-66	RPS-91-67	RPS-91-68
Sample Type:		ОТСН	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH	DTCH
UNITS		NGG	UGG	000	000	nge	nge	000	990
DATE SAMPLED:	LED:	16/07/60	16/02/60	09/20/91	09/20/91	09/20/91	19/20/91	09/20/91	16/02/60
DEPTH		0.000	0000	0000	0.000	0.000	0.000	0.000	0000
SVOCs	123PDA								
	24DNT	ı	ı	1	ı	,	ı	6.850	i
	Z6DNT	ı		ı	1	ı	1	0.783	ŧ
	B2EHP	•	,	ı	1	,	ı	ı	i
	BAANTR	•	,	0.193	ı	•	,		•
	BBFANT	ı	ı	,	ı	,	•	ı	ı
	BGHIPY	1	,	ı	1	,	i	1	1
	CHRY	•	ı	ł	ı	ı	t	•	ı
	DEP	ı	,	•	ı	,	•	ı	1
	FANT	ı	1	ı	1	ı	ı	0.046	ı
	NG	0.709	1	1	1.540	ı	1	ı	,
	NNDMEA	1	1	1	ı	ı	ı		1
	NNDNPA	1	1	ı	1	,	•	ı	1
	NNDPA	3.370	1	0.476	86.000	0.138	1.370	200.000	0.129
	PHANTR	•	1	ı	•	J	1	1	•
	PYR	1	ı	1	ı	J	ı	1	
Metals	CR	10.700	15.500	71.100	20.900	7.730	8.620	10.800	10.400
	HG	•	Ĭ	1	ı	ı	ı	ı	i
	PB	¥.000	29.000	44.000	32.000	19.000	27.000	72.000	19.000
Anions	NIT	6.950	4.170	3.560	069'6	8.460	6.120	4.100	2.910
	804	,	ł	•	12.800	22.900	ı	1	•
Indicator	NH3								
parameter									

TABLE 8-9
SUMMARY OF SOIL AND SEDIMENT CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	1 than the Certified Reporting Limit (CRL)	season than the reported value	Season found in blank as well as sample	eren and results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
•	•			*								•	•	
Ξ	3	ngr	VOC	SVOC	Blank cell	•	5	£	ŋ	۵.,	æ	s	-	×

Appendix K contains complete analytical results.

USATHAMA chemical codes are defined in the RI Report Glossary

TABLE 8-10
SUMMARY OF SURFACE WATER CHEMICAL DATANITROGLYCERINE POND/ROCKET PASTE AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

		NFW-91-01	70-14-AJN	IN-IK-ALV	20-16-MJY
Sample Type:		POND	POND	POND	POND
CNITS		ner	19A	UGF	COL
DATE SAMPLED:		09/22/91	16/27/60	09/20/91	16/02/60
DEPTH:		0.000	0000	0.000	0000
SVOCs	N2KJEL	1800.000	3100.000	2600.000	3800.000
	NH3N2	63.400	147.000	33.800	63.400
Metals	٧Ľ	3020.000	2140.000	\$410,000	31400,000
	YS	5.430	4.980	8.600	15.000
	BA	47.300	63.100	121.000	290.000
	BE		ŀ	,	2.170
	۲	11700.000	15200,000	30800.000	38200.000
	ಜ	•	1	,	29.500
	20	•	1	21.300	79.100
	FE	3970.000	2920.000	7980,000	31700.000
	HG	0.325	0.324	,	•
	¥	12800.000	15000.000	43000.000	44000.000
	MG	\$340.000	\$880.000	14900.000	20900.000
	Z	81.700	207.000	152.000	603.000
	ž	7790.000	8320.000	1190.000	2000.000
	8 2	41.200	45,900	910.000	3100.000
	>	8.370	6.620	22.300	27.100
	ZN	•	1	34.900	151.000
Anons	T T	1680.000	1930.000	2700.000	2730.000
	L'X	ı	1	10.500	•
	204	4070.000	4470.000	32000.000	35000.000
Indicator	ALK	116000	78106	128000	124000
parameter	HARD	\$8200	\$4100	491000	129000

TABLE \$10 SUMMARY OF SURFACE WATER CHEMICAL DATA NITROGLYCERINE POND/ ROCKET PASTE AREA REMEDIAL INVESTIGATION BADGER ARMY AMMUNTION PLANT

Notes and fingging codes:

	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits	
	•			•	•	•			и	•		1		•	
ε	3	ner	S OC	SVOC	Blank cell	•	GT	æ	9	۵.	~	S	–	×	

Appendix K contains complete analytical results

USATHAMA chemical codes are defined in the RI Report Glossary

TABLE 8-11
SUMMARY OF GROUNDWATER CHEMICAL DATANITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

2		1 think	00		000	70 7184		7.00	
Sample Type:	نۆ	E A	WELL WELL UGI	M WI	WELL.	NFM = 89 = 02 WELL UGI	70 - T		WELL WELL
DATE SAMPI.ED:	M.ED:	11/25/91 ONE	04/14/92 TWO	12/12/91 ONE	04/15/92 TWO	12/12/91 ONE	04/21/92 TWO	12/12/91 ONE	04/22/92 TWO
VOC	13DMB	1	ı	ı	1	ı	•	,	1
	ACET	i	1	1	•	•	•	ı	1
	CCI.4	1	•	•		1	•	,	1
	CH2CL2	ı	6.76 B	4.02 P	4.12 P	4.9 P	5.78 B	4.71 P	\$.69 B
	CHCL3	1	1	•	ı	•	•	ı	15.1
	DEETH								
	MEC6H5	1	ı	•	ı		ı	,	•
	TRCLE	•	1		1	•	•	į	•
SVOCs	B2EHP TB1MB7			92.4	ŧ	1	32 P	ı	•
	1 KIMDE								
Metals	₹ <								
	56	ı	,	ı	1	1	ı	,	ı
	2	6.52	1	6.31	ı	•	1	5.5	í
	CC								
_	FE								
	¥								
	W.								
	Ž ž								
_	E &	1	ı	ı	ı	11.2		,	•
· <u>-</u>	! >					•	:		
	ZN								
Anions	Ħ			3100	1600	7000	960	2500	4100
	ວັ	25000 X		14000	1,5000	26000 P	26000 P	7500	7600
	SC4	36000	36000	38000	37000	38000	37000	31000	32000
Indicator	ALK	278000	284000	209000	270000	272000	293000	327/100	315000
parameter	HARD	330000	330000	302000	310000	324000	345000	3801110	373000
	ZIZ	1	1	1	•	1	ı	•	•
	TUS	392000	357000	375000	304000	36000	384000	413000	381000
	pH(1)	7.0	7.6	7.6	7.6	8.2	7.5	7.5	7.5
	Sp.Cond (2)	673	283	184	638	259	265		283

TABLE 8-11
SUMMARY OF GROUNDWATER CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA/ NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

i			_		#				ı					_											_	1				
8.0	64/H	1	1	i	S.580	1		•	: ;		:	78(00)	1	ı				1	7	•			2200	2.W.OU	110000	736000	H2000	O MAL 197	11	466
NAN-81-04B WELL UGL	- 11				_													•	-					•	_	0	•	۰	,	
Z	12/11/91 ONE	1	1	1	4.9	ı		1	1			7500	3.41	8.46				200	1	ı			2000	2300	\$1000	22800	29000	388000	7.7	8°.
	75				2							2						\$	2 9	!			0	<u>د</u> Ω	8	8	8	8	} .	_
NAN-81-03C WELL UGL	04/13/92 TWO	ı	ı	١	6.86	1		1	'			81000	1	1				Š	10 200				1000	29000	150000	2620	34.50	5310	7.7	131
WELL WELL					_																		×	_						
ž	12/11/91 ONE	4	ı	i	3.920	•		1	1			81000	3.29	8.83					- 17	٠ ،			11000	27000	15000	252000	276000	\$24000	7.7	796
					æ																			×						
03B	04/12/92 TWO	ı	ı	ı	5.780	ı		t	,			00059	•	1				9	3 1	1			2000	27000	45000	240000	284000	311000	7.5	9 ,
NAN-81-03B WELL UGL					۵,													ţ-						۵.						
Ä	12/11/91 ONE	ı	ı	ı	4.310	ı		•	•			70000	1	5.370					3 1	ı			4000	23000	39000	2400fa	256000	316000	1.7	\$21
					20																									
02B	04/12/92 TWO	1	,	,	5.490	•		ł	,			00096	,	8.23				20000	25.600	,			980	45000	10000	342000	416000	\$03000	7.4	753
NAN-81-02B WELL UGL		•			۵.				İ									÷					×							
IV	12/11/91 ONE	ı	ı	1	4.610	•			,			100000	1	9.120				00000	3	,			11000	37000	100000	248000	402000	\$07000	7.5	737
																								۔						
	04/12/92 TWO	ı	ı	1	1	1		ı	'			79000	1	ı				0000	3 1	t			0058	26000	81000	290000	348000	411000	7.5	899
NAN-81-01A WLLL UGL											!																			
NAN-					_				1															۵.	i					į
	12/11/91 ONE	ı	ı	1	4.120	•		•	•			8,000	,	ı				ı	: 1	ı			7300	24000	64000	246000	330000	384000	7.6	639
	ä	13DMB	ACET	CCL4	CH2CL2	CI3	DEETH	C6H5	IRCLE	B2EHP TRIMB2	<u></u>	ა	co	ຬ	CG	: :	. ي	2 ≤	; , =	ĕ	>	Z.	LIX	C C	\$0 1	X	IARD	SOL	pH(1)	Sp.Cond.(2)
je	MPLE	131	¥	ರ	CH	₹	DE	WE	×	BZ TRI	-	J	J	J	J		- 2	e 2	. ~	- 134		7	Z	_				. F	7	Sp.Cc
Site ID. Sample Type: UNITS:	DATE SAMPLED: ROUND:	VOCs							1	SVOC	Metals												Anions			Indicator	parameter			

TABLE 8-11
SUMMARY OF GROUNDWATER CHEMICAL DATANI IROGLYCERINE POND/ ROCKET PASTE AREA/ NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

		2	7		5110	i		-	41		•
306 117.		2	750-18-17		21110	7	111	7 ·	71.		•
Sample Type: UNITS:			WELL UGI.		WELL UGL	Ď	WELL UGL	Ď	WELL	WELL	<u>.</u> ,
DAITE SAMPLED:	PLED:	12/11/91	04/14/92	12/12/91	04/22/92 TWO	12/12/91 ONE	04/22/92	11/24/91	04/22/92	11/23/91	(4/15/92
NOON.		CNE	OMI	ONE	OMI	CINE	OMI	ONE	OMI	CAC) *
VOCs	13DMB	1	•							,	4
	ACET	ı	•							,	,
	700	ı	1							36.3	ı
	CH2CL2	4.61 P	8.78	8						3.63 P	
	CHCL3	,	ł							,	0.543 P
	DEETH		8	S							
	MEC6H5	ł	•							,	,
	TRCLE	1	1							ı	,
SVOC	BZEHP										ì
	TRIMBZ										
Metals	BA									110	98.000
	Ş	00039	00019							90000	97000
	CD	•	1							,	•
	S.	1	1							9.2	1
	CC									J	69 †
	표									J	1
	¥									2200 T	7130
	MG									42000	41000
	٧	18000 T	12000							2720 T	. 00011
	Z.	ı	•							ı	1
	PB	1								1	•
	>									5.42	12.5
!	ZN									148	1
Anions	Ę	2500	0081	4000	2900	l	810	4400	3700	3400	1706
	ರ	14000	14000	14000	00051	3200 P	4600	23000	25000 X	26000 P	SARON F
	SO4	21000	\$2000	31000	31000	18000	17000	28000	28000	12000	14000
Indicator	ALK	192000	194000	268000	270000	331000	314000	302000	30,5000	307000	301000
parameter	HARD	274000	262000	292000	324000	308000	323000	352000	362000	354040	36/000
		00000									;
	SO	2910XX	273000	389000	323000	344000	3.35000	400000	383000	344000	346100
	pff (3)	7.8	7.5	7.7	7.7	7.3	7.7	7.7	7.6	7.4	7.5
S	Sp.Cond.(2)	470	557	391	510	3 8	S14	533	578	655	624

TABLE 8-11
SUMMARY OF GROUNDWATER CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA/ NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

	04/21/92 TWO	ı	ı	ı	S.69 B	ı					1		1	4.71		_				;	7.46	-		1700	18000	37000	2840th)	322000		35 4000	9.6	570
WELL	li	ı	7.5 S	ı	4.8 P	•		1	,				1	15.9							ı			3500	00081	37000	25000	258000		345000	8 .3	628
	04/22/92 TWO	1	1	1	S.78 B	1		1					•	,							,			0099	00061	49000	293000	343000	,	377000	7.7	578
SIII8 WELL UGL	12/12/91 ONE	1	1	•	4.12 P	ŀ								6.85							•			9000	19000	21000	261000	342000		401000	7.6	\$ 5 .
	04/23/92 TWO	•	1	1	7.84 B	0.594 P			1				,	1	ı						1		t	3400	32000 P	3000	334000	323000		369000	7.6	767
SIII6 WELL UGL	11/24/91 ONE	i	1	1	4.61 P	1			1				1	=	ı					ı	•		197	3800	31000 P	28000	262000	328000		371000	7.5	663
	04/23/92 TWO	ı	1	•	7.55 B	ı		•	1				1	ı	17.4					•	•		1	0057	14000	19000	248000	308000		311000	9.7	421
SIIIS WELL UGL	11/24/91 ONE	ı	1		4.61 P								ı	11.9	4.790						,		68	0005	14000	17000	240000	282000		320000	7.7	430
	04/22/92 TWO	1	1	•	5.39 B	ı		ı		1	24.4	20000	1	1	1	ı	1500 T	38000	3030 T	,	1	17.8	1	0075	2000	22000	30400	283000		272000	7.9	454
S1114 WELL UGI					۵.												۲		(-											_		
	11,23/91 ONE	ı	1			0.835			0.531		İ	91000			1												, ,	•		269000		
i,be:	DAIE SAMPLED: ROUND:	13DMB	ACET	CCL4	CH2CL2	CHCL3	DEETH	MECOH:	TRCLE	B2EHP TRIMBZ	BA	V O	9	S	CG	Ή	×	MG	₹ Z	Z	82	>	ZN	EX	J.	804		er HARD	CHN	SCIT	pff(1)	Sp.Cond.(2)
Site ID. Sample Type:	DAIE SA ROUND:	VOC.	1							SVOCS	Metals													Anions			Indicator	parameter				

TABLE 8–11
SUMMARY OF GROUNDWATER CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA/ NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

	l l		S		2.	<u>~</u>			-		1	_											_	,		×		!					
1 .	04/14/92 TWO	i	14.0	ı	4.61	0.634		1	,					1	,							•			900	27000	38000	232000	306000	1	288400	1.4	3.
SIIS WELL UGL	11/24/91 ONE	1	•	ı	4.41 P	1		ı						•	6.16							•				24000 X	38000	244000	314000	5.55	387000	6.5	633
	04/14/92 TWO	1	•	•	7.35 B	•		ı	1					•	•							1			. 1 00	3900	25000	262000	278000	1	000697	7.7	481
S1125 WELL UGL	12/10/91 ONE	1	•	•	4.61 P	1		•	-					•	5.5							•			909	3800	25000	294000	240000	1	313000	8.4	557
	04/14/92 TWO	1	1	•	5.88 B	•		ı	1					ı	ı							ı			2200	24000	19000	458000	451000	1	\$03000	7.5	802
S1124 WELL UGL	12/09/91 ONE	6.8	1	1	5.2 P	•		S.19 P	-		7.0 S			ı	7.73							1			2700	20000	21000	469000	438000	•	496000	8.3	849
	04/13/92 TWO	1	ı	•	7.25 B	ı						30.9	80000		ı	4.76	28.4	1390 T	43000	Z-2000 T	•	•	9.18		26	90069	10001	294000	366000		391000	7.8	929
Si121 WELL UGL	12/09/91 ONE	4.7 S		1	5.49	•		ı	•	ı		28.3	9000	,	,	,	28.8	1140 T	39000	Z5000 T	i	,	•		2600	93000	00001	278000	338000		37.5000	8.3	740
	04/2±/92 TWO	1	1	•	6.86 B	•		1	•					•	,							10 200			2100	0086	27000	249000	316000	1	315000	7.7	488
S1120 WELL UGL		S			۵.					,	S																						,
	12/08/91 ONE	6.1	ı	ı	5.0	•		1		;	2			ı	7 26							;		1	3100	9400	27000	296000	864000	88	300000		-
1	PLED:	13DMB	ACET	CCL	CH2CL2	CHCL3	DEETH	MEC6HS	INCLE	BZEHP	TRIMBZ	BA	క	9	5	CG	E	¥	MG	ž	Z	PB	>	ZN	Ë	บี	204	ALK	HARD	CHN H3	TDS	pH(1)	Sp.Cond.(2)
Site ID: Sample Type: UNITS:	DATE SAMPLED: ROUND:	VOC							1 0 1 1 1	SVOC	1	Metals												!	Autons			Indicator	parameter				

TABLE 8-11
SUMMARY OF GROUNDWATER CHEMICAL DATANITROGLYCERINE POND/ ROCKET PASTE AREA/ NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Votatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
				×			*	#	H		*			ч
ε	3	ner	VOC	SVOC	Blank cell		GT.	8	ŋ	ے	~	S	Į-	×

USATHAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results

TABLE 8-12 TCLP METALS DATA SUMMARY CONCENTRATION IN SEDIMENT NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		ONCENTRATION (µg		
SAMPLE LOCATION	CD	CR	PB	HG
TCLP RL ¹	1,000	5,000	5,000	200
Minimum Reporting Value	6.8	16.8	43.4	0.1
NPS- 89- 01	NT	NT	NT	LT
NPS-89-02	NT	NT	NT	0.3
NPS- 89- 03	NT	NT	NT	LT
NPS-89-04	NT	NT	NT	LT
NPS-89-05	NT	NT	NT	LT
NPS-89-06	NT	NT	NT	LT
NPS-89-07	NT	NT	NT	LT
NPS-89-08	NT	NT	NT	LT
NPS-89-09	NT	NT	NT	LT
NPS-89-10	NT	NT	NT	LT
RPS-90-01	LT	LT	4,378	NT
RPS-90-02	LT	LT	3,806	NT
RPS-90-03	LT	LT	26,480	NT
RPS-90-04	LT	LT	427	NT
RPS-90-05	LT	LT	NT	NT
RPS-90-06	LT	LT	1,011	NT
RPS-90-07	LT	LT	728	NT
RPS-90-08	LT	LT	NT	NT
RPS-90-09	LT	LT	368	NT
RPS-90-10	8	LT	7,449	NT
RPS-90-11	LT	LT	541	NT
RPS-90-12	LT	LT	4,75 5	NT
RPS-90-13	LT	LT	1,081	NT
RPS-90-14	LT	LT	NT	NT
RPS-90-15	LT	LT	N ⁻	NT
RPS-90-16	LT	LT	2 :	NT
RPS-91-17	LT	LT	ţ	LT

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continued

TABLE 8-12 TCLP METALS DATA SUMMARY CONCENTRATION IN SEDIMENT NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	TCLP LEACHATE C	ONCENTRATION (µg	/4)	
SAMPLE LOCATION	CD	CR	PB	HG
TCLP RL1	1,000	5,000	5,000	200
RPS-91-18	LT	LT	1,660	LT
RPS-91-19	LT	LT	LT	LT
RPS-91-20	LT	LT	517	LT
RPS-91-21	LT	LT	90	LT
RPS-91-22	LT	LT	LT	LT
RPS-91-23	LT	LT	427	LT
RPS-91-24	LT	LT	256	LT
RPS-91-25	LT	LT	242	LT
RPS-91-26	LT	LT	111	LT
RPS-91-27	LT	LT	170	LT
RPS-91-28	LT	LT	91	LT
RPS-91-29	LT	LT	LT	LT
RPS-91-30	LT	LT	968	LT
RPS-91-31	LT	LT	3,860	LT
RPS-91-32	LT	LT	152	LT
RPS-91-33	LT	LT	LT	LT
RPS-91-34	LT	LT	LT	LT
RPS-91-35	LT	LT	92	LT
RPS-91-36	LT	LT	LT	LT
RPS-91-37	LT	LT	LT	0.1
RPS-91-38	LT	LT	427	LT
RPS-91-39	LT	LT	136	LT
RPS-91-40	7.7	LT	30 5	0.2
RPS-91-41	LT	LT	LT	LT
RPS-91-42	LT	LT	LT	LT
RPS-91-43	LT	LT	LT	LT

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TABLE 8-12 TCLP METALS DATA SUMMARY CONCENTRATION IN SEDIMENT NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	TCLP LEACHATE C	ONCENTRATION (µg	/2)	
SAMPLE LOCATION	CD	CR	PB	HG
TCLP RL ¹	1,000	5,000	5,000	200
RPS-91-44	LT	LT	LT	LT
RPS-91-45	LT	LT	LT	LT
RPS-91-46	LT	LT	LT	LT
RPS-91-47	LT	LT	LT	LT
RPS-91-48	LT	LT	LT	LT
RPS-91-49	LT	LT	LT	LT
RPS-91-50	LT	LT	LT	LT
RPS-91-51	LT	LT	95	LT
RPS-91-52	LT	LT	LT	LT
RPS-91-53	LT	LT	LT	LT
RPS-91-54	LT	LT	LT	LT
RPS-91-55	LT	LT	LT	0.1
RPS-91-56	LT	LT	LT	LT
RPS-91-57	LT	LT	LT	LT
RPS-91-58	LT	LT	LT	LT
RPS-91-59	LT	LT	LT	LT
RPS-91-60	LT	LT	LT	LT
RPS-91-61	LT	LT	LT	LT
RPS-91-62	LT	LT	LT	LT
RPS-91-63	LT	LT	LT	LT
RPS-91-64	LT	LT	LT	LT
RPS-91-65	LT	LT	LT	LT

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continued

TABLE 8-12 TCLP METALS DATA SUMMARY CONCENTRATION IN SEDIMENT NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	TCLP LEACHATE C	ONCENTRATION (µg	/2)	
SAMPLE LOCATION	CD	CR	PB	HG
TCLP RL1	1,000	5,000	5,000	200
RPS-91-66	LT	LT	LT	LT
RPS-91-67	LT	LT	LT	0.1
RPS-91-68	LT	25	LT	LT

Notes:

TCLP Regulatory Levels (RLs) exist for the following metals: AS, BA, CD, CR, SE, PB, HG, and AG. However, these results were reported only for CD, CR, PB, and HG. (List of USATHAMA Chemical Codes for definitions of chemical abbreviations).

NT = Not tested

LT = Less than TCLP RL

TABLE 8-13 COMPOUNDS OF POTENTIAL CONCERN NITROGLYCERINE POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		TON	
COMPOUND OF CONCERN	Surface Soil ¹ (µg/g)	POND SEDIMENT ² (µg/g)	SURFACE WATER ³ (mg/l)
AL		••	3.02
AS			0.00543
ВА	-		0.0631
CL			1.93
CR		40.5	
HG	2.4	20	0.000325
MN	-		0.207
NG	15.8		
NH3	17.7	72.5	
NH3N2	-		0.147
PB	10,000	410	0.0459
SO4			4,47
v.	- -	••	0.00837

Notes:

= Not identified as a compound of potential concern
 Exposure point concentration is the maximum detected concentration

 μ g/g = micrograms per gram; equivalent to parts per million (ppm)

mg/2 = milligram per liter

Assessment of surface soil contamination was performed using samples from NPS-91-09 and NPS-91-10.
Assessment of sediment contamination was performed using samples from NPS-91-01 through NPS-91-08.

Assessment of surface water contamination was performed using samples NPW-91-01 and NPW-91-02.

TABLE 8-14 SUMMARY OF RISK ESTIMATES NITROGLYCERINE POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
	Soil Ingestion	ND	0.008
Current and Future Grounds Maintenance Worker	Inhalation of Particulates and Volatiles	ND	0.000008
	Total	ND	0.008
Future Residential	Soil Ingestion	ND	0.1
Future Child Playing	Ingestion of Sediment	,ND	0.03
	Ingestion of Surface Water	4×10 ⁻⁸	0.0006
	Dermal Contact with Surface Water	4×10 ⁻⁸	0.0006
	Total for Child Playing	8x10 ⁻⁹	0.0312

Notes:

ND = Not determined - cancer slope factors not available for compounds of potential concern.

Table 8-15 Compounds of Potential Concern Rocket Paste Area

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITI N PLANT

	Expos	SURE POINT CONCENTRATION	
COMPOUND OF CONCERN	Surface Soil' (µg/g)	POND SEDIMENT ² (µg/g)	Surface Water ³ (mg/ <i>l</i>)
24DNT	8.0	••	
26DNT	32.5		
BAANTR	0.666		
BBFANT	2.13		••
BGHIPY	1.91	-	•-
CHRY	1		
DEP	49.8	2.46	
FANT	1.12	, 	•-
NG	1,500	1.76	
NNDMEA	0.302		
NNDNPA	0.23		
NNDPA	10,000	4.98	
PHANTR	0.279		••
PYR	0.932		
AL			3.14
AS			0.015
ВА			0.29
BE		-	0.00219
CL	-	••	2.73
CR	109	45.7	0.0595
CU	••		0.0791
HG	0.716	0.157	
MN	**		0.503
NH3N2			0.0634
NI			0.0407

continued

TABLE 8-15 COMPOUNDS OF POTENTIAL CONCERN ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	Ехго	SURE POINT CONCENTRATION	
COMPOUND OF CONCERN	Surface Soil.1 (µg/g)	POND SEDIMENT ² (#g/g)	Surface Water ³ (mg/t)
NIT	120	2.22	0.0105
PB	3,500	2,600	3.1
SO4	22.9	210	35
V	No.	**	0.0571
ZN	••		0.151

Notes:

- Not identified as a compound of potential concern Exposure point concentration is the maximum detected concentration

 μ 9/9 = micrograms per gram; equivalent to parts per million (ppm)

mg/t

= milligrams per liter

Assessment of surface soil contamination (0 to 2 feet) was performed using samples from RPS-91-03 through RPS-91-68.

Assessment of sediment contamination was performed using samples from RPS-91-01 and RPS-91-02.

Assessment of surface water contamination was performed using samples RPW-91-01 and RPW-91-02.

TABLE 8-16 SUMMARY OF RISK ESTIMATES ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
	Soil Ingestion	2x10 ⁻⁵	0.04
Current and Future Grounds Maintenance Worker	Inhalation of Particulates and Volatiles	7×10 ⁻⁹	<u>ND</u>
	Total for Grounds Maintenance Worker	2x10 ⁻⁵	0.04
Future Residential	Soil Ingestion	1x10 ⁻³	6.0
Future Child Playing	Ingestion of Sediment	1x10 ⁻⁹	0.003
	Ingestion of Surface Water	1x10 ^{.7}	0.002
	Dermal Contact with Surface Water	1x10 ⁻⁷	0.002
	Total for Child Playing	2x10 ⁻⁷	0.007

Notes:

ND = Not determined - no toxicity factors available for compounds of potential concern.

TABLE 8-17
COMPARISON OF GROUNDWATER TO STANDARDS
UNITS: \(\mu g/\eta\)

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND OF	FREQUENCY	Maximum	Мимом	SDWA (1)	(1)	WI GROU	WI GROUNDWATER STANDARDS (2)	CALCULATED
POTENTIAL	OF DETECTION	DETECTED CONCENTRATION	DETECTED CONCENTRATION	MCL	MCLG	ES	PAL	CONCENTRATION (3)
ВА	9:9	110	24.4	2,000	2,000	1,000(c)	200(c)	
CD	2:42	3.41	3.29	ഗ	ß	10(d)	1(d)	•
CHCL3	5:42	1.51	0.543	•	•	g	9.0	
cr Cr	48:48	89,000	3,200	250,000(a)	•	250,000(e)	125,000(e)	
CR	19:42	11.9	4.71	100	100	50(f)	5(f)	
cn	4:10	17.4	4.69	F	1,300	•	•	
V	16:18	000'66	2,350	20,000(b)		ı	•	,
ΙŽ	48:48	11,000	810	10,000	10,000	10,000	2,000	,
PB	4:42	17	7.46	F	0	50(g)	5(g)	
804	48:48	150,000	10,000	250,000(a)		ı	ı	
THOLE	1:42	0.531	-	သ	0	5	0 18	

NITROGLYCERINE POND/ROCKET PASTE AREA/NEW ACID AREA COMPARISON OF GROUNDWATER TO STANDARDS UNITS: Mg/8 **TABLE 8-17**

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

COMPOUND OF	FREQUENCY	MAXIMUM	MINIMUM	SDWA (1)	1 (1)	WI GRON	WI GROUNDWATER STANDARDS (2)	CALCULATED
POTENTIAL	OF DETECTION	DETECTED CONCENTRATION	DETECTED CONCENTRATION	MCL	MCLG	ES	PAL	CONCENTRATION (3)
>	5:6	17.8	5.25	•	,			260
ZN	4:10	197	26.1	5,000(a)	•	5,000(e)	2,500(e)	7,300

Sources:

- U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards." Office of Water, Washington, D.C., August 1991, "Fact Sheet: National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inciganic Chemicals and Inciganic Chemicals and Inciganic Chemicals." Inciganic Chemicals, Final Rule," 57FR31776, July 17, 1992 (see Subsection 3.6 for details). Ξ
 - wisconsin Administrative Code, Chapter NR 140.10, Table 1 (see Subsection 3.6 for details). Calculated to be protective at risk of 10 to H of 1 (see Subsection 4.5 for details).

Notes:

Treatment technique requirement in effect Preventive Action Limit A F Reporting level. Monitoring is required and data is reported to health officials to protect Secondary drinking water standard, suggested level. 33

Copper action level = 1,300 µg/f, Lead action level = 15 µg/t

- - WI proposing change to ES = 2.000 $\mu g/t$ and PAL = 400 $\mu g/t$ WI proposing change to ES = 5 $\mu g/t$ and PAL = 0.5 $\mu g/t$ individuals on restricted sodium diet. 3 **3** 3
- Value for protection of public welfare (usually aesthetic concerns) rather than protection of
 - public health.
- Wi proposing change to ES = 100 µg/t and PAL = 10 µg/t
- WI proposing change to ES = 15 µg/t and PAL = 1.5 µg/t = 3
 - micrograms per liter yg/t SDWA

Maximum Contaminant Level

MCL

- Safe Drinking Water Act
- Maximum Contaminant Level Goal MACIG
 - **Enforcement Standard**

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TABLE 8-18
ECOLOGICAL CONTAMINANTS OF CONCERN^A
NITROGLYCERINE POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATIONS
Surface Soil ^C		
HG	1:2	2.4
NG	2:2	15.8
NH3	2:2	17.7
PB	2:2	10,000
Surface Water ^D		
AL	2:2	3,020
AS	2:2	5.43
ВА	2:2	63.1
CL	2:2	1,930
FE	2:2	3,970
HG	2:2	0.325
MN	2:2	207
NH3N2	2:2	147
PB	2:2	45.9
SO4	2:2	4,470
V	2:2	8.37
<u>Sediment</u> ^E		
CR	8:8	40.5
HG	8:8	20
NH3	8:8	72.5
PB	8:8	410

- Constitutents selected based on criteria presented in Tables Q-18, Q-19, and Q-20 and discussed in Section 5.0.
- 95th percentile or maximum; units in $\mu g/g$ (surface soil and sediment) and $\mu g/\ell$ (surface water).
- Assessment of surface soil contamination was performed using samples from NPS-91-09 and NPS-91-10.
- Assessment of surface water contamination was performed using samples NPW-91-01 and NPW-91-02.
- Assessment of sediment contamination was performed using samples NPS-91-01 and NPS-91-08.

TABLE 8-19 ECOLOGICAL CONTAMINANTS OF CONCERN^A ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION
Surface Soil [©]		
24DNT	12:72	810
26DNT	10:72	32.5
BAANTR	4:72	0.666
CHRY	8:72	1
CR	66:66	109
DEP	37:72	49.8
FANT	20:72	1.12
HG	17:66	0.716
NG	42:66	1,500
NIT	65:66	120
NNDMEA	7:22	0.302
NNDNPA	5:72	0.23
NNDPA	58:72	10,ა00
PB	· 66:66	3,500
PHANTR	14:72	0.279
PYR	8:72	0.932
SO4	17:66	22.9
Surface Water ^D		
AL	2:2	31,400
AS	2:2	15
ВА	2:2	290
BE	1:2	2.17
CL	2:2	2,730
CR	1:2	59.5
CU	2:2	79.1
FE	2:2	31,700

TABLE 8-19 ECOLOGICAL CONTAMINANTS OF CONCERN^A ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION ⁸
MN	2:2	503
NH3N2	2:2	63.4
NI	1:2	40.7
NIT	1:2	10.5
РВ	2:2	3,100
SO4	2:2	35,000
V	2:2	57.1
ZN	2:2	. 151
<u>Sediment</u> ^E		
CR	2	45.7
DEP	1	2.46
NG	1	1.76
NIT	2	2.22
NNDPA	2	4.98
PB	2	2,500
SO4	2	210

- A Constitutents selected based on criteria presented in Tables Q-16 and Q-17 and discussed in Section 5.0.
- 95th percentile or maximum; units in $\mu g/g$ (surface soil) and $\mu g/\ell$ (surface water).
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples from RPS-91-03 through RPS-91-68.
- Assessment of surface water contamination was performed using samples from RPW-91-01 and RPW-91-02.
- Assessment of sediment contamination was performed using samples from RPS-91-01 and RPS-91-02.

TABLE 8-20 RISK EVALUATION FOR AQUATIC RECEPTORS NITROGLYCERINE POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	EXPOSURE POINT CONCENTRATION ^A	RTV ^a	HAZARD QUOTIENT ^C
Surface Water			
AL	3,020	248	4
AS	5.43	153	0.035
ВА	63.1	1,360	0.046
FE	31,700	1,000	31.7
CL	1,930	230,000	0.02
HG	0.325	0.012	27
MN	207	100	2.1
NH3N2	147 .	2,100	0.07
PB	45.9	3.2	14
SO4	4,470	1,060,000	0.0042
V	8.37	200	0.042
<u>Sediments</u>			
CR	40.5	100	0.41
HG	20	0.1	200
NH3	72.5	75	0.97
PB	410	50	8.2

Analytical results presented in Tables Q-19 and Q-20 and summarized in Table 8-18.

Reference Toxicity Value (RTV) derived from available quality criteria and effects threshold levels as presented in Table Q-3.

Calculated by dividing the exposure point concentration by the RTV; values in excess of 1.0E+00 indicate that the protective RTV was exceeded by environmental concentrations.

TABLE 8-21 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL RECEPTORS NITROGLYCERINE POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	HAZARD INDICES ^A			
RECEPTOR	ACUTE RISK ⁸	CHRONIC RISK ^C		
Short-tailed shrew	1.9E+04	3.8E+05		
Eastern meadowlark	4.3E+02	4.8E+02		
Garter snake	9.3E+02	7.4E+03		
Red fox	1.7E+01	1.3E+00		
Red-tailed hawk	5.0E+01	2.3E+00		

- Sum of the individual Hazard Quotients for each surface soil contaminant of concern; each HQ calculated by dividing the estimated exposure dosage by the Reference Toxicity Value (RTV). Hazard Quotients are presented in Appendix R. Tables R-55 and R-56 for acute and chronic exposures, respectively.
- Based on comparison with acute RTVs.
- Based on comparison with chronic RTVs.

TABLE 8-22 RISK EVALUATION FOR AQUATIC RECEPTORS ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	EXPOSURE POINT CONCENTRATION ^A	RTV*	HAZARD QUOTIENT
Surface Water			
AL	31,400	748	41.9
AS	15	153	0.098
BA	290	1,360	0.21
BE	2.17	5.3	0.41
CL	2,730	230,000	0.029
CR	59.5	9.74	6.1
CU	79.1	2.27	35
FE	31,700	1,000	32
MN	503	100	5
NH3N2	63.4	2,100	0.03
NI	40.7	66.13	0.62
NIT	a 10.5	5,000	0.0021
PB	3,100	3.2	970
SO4	35,000	1,060,000	0.033
V	57.1	200	0.29
ZN	151	49.59	3
Sediment			
CR	45.7	100	.46
NIT	2.22	54.5	.004
РВ	2,600	50	52
SO4 .	210	•	-
DEP	2.46	-	-

continued

TABLE 8-22 RISK EVALUATION FOR AQUATIC RECEPTORS ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	EXPOSURE POINT CONCENTRATION ^A	RTV ^a	HAZARD QUOTIENT ^C
NNDPA	4.98	-	-
NG	1.75	•	•

- Analytical results presented in Tables Q-17 and summarized in Table 8-19.
- Reference Toxicity Value (RTV) derived from available quality criteria and effects threshold levels as presented in Table Q-3
- Calculated by dividing the exposure point concentration by the RTV; values in excess of 1.0E+00 indicate that the protective RTV was exceeded by environmental concentrations.

TABLE 8-23 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL SECEPTORS ROCKET PASTE AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	HAZARD INDICES ^A			
RECEPTOR	ACUTE RISK ⁸	CHRONIC RISK ^C		
Short-tailed shrew	6.6E+03	1.3E+05		
Eastern meadowlark	1.5E+02	4.4E +02		
Garter snake	3.3E+02	6.5E+03		
Red fox	1.9E+01	1.4E+02		
Red-tailed hawk	2.9E+01	3.0E+02		

- Sum of the individual Hazard Quotients for each surface soil contaminant of concern; each HQ calculated by dividing the estimated exposure dosage by the Reference Toxicity Value (RTV). Hazard Quotients are presented in Appendix R. Tables R-53 and R-54 for acute and chronic exposures, respectively.
- Based on comparison with acute RTVs.
- Based on comparison with chronic RTVs.

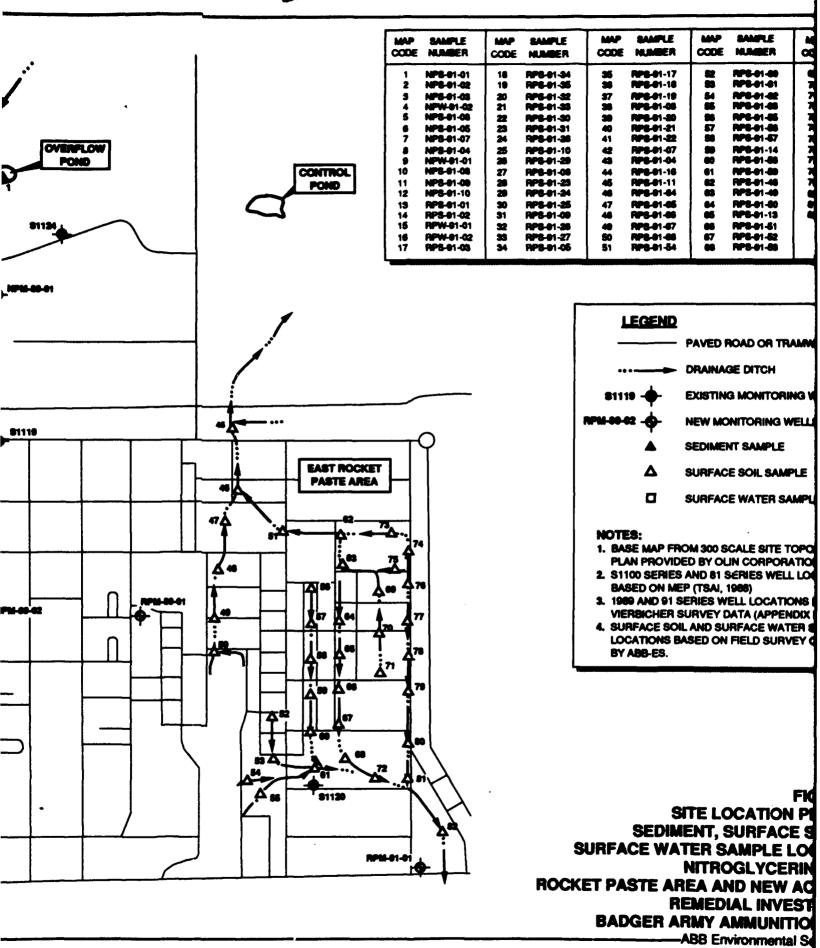
NITROGLYCER POND OVERFLOW POND NAN-81-818,C ROCKET PASTE POND 81119 WEST ROCKET PASTE AREA 44 **Ā**37 SCALE IN FEET 1600 8ÓO 92000000 abc

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MAP CODE	SAMPLE NUMBER	MAP	SAMPLE NUMBER	CODE	SAMPLE NUMBER	MAP CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER
1	NPS-91-01	18	RPS-01-34	36	RPS-01-17	52	RPS-91-60	•	RPS-01-12
2	NPS-91-02	19	RPS-01-35	36	RPS-01-18	53	RPS-91-61	70	RPS-81-45
9	NPS-01-03	20	RPS-01-32	37	RPS-01-19	54	RPS-01-62	71	RPS-01-46
Ā	NPW-91-02	21	RPS-01-33	36	RPS-01-06	55	RPS-01-63	72	RP8-01-47
5	NPS-01-06	22	RPS-01-30	30	RPS-01-20	58	RPS-01-65	73	RPS-01-36
•	NPS-81-05	23	RPS-01-31	40	RPS-01-21	57	RPS-01-56	74	RPS-01-37
7	NPS-01-07	24	RPS-01-26	41	RPS-01-22	58	RPS-01-57	75	RPS-01-44
	NPS-81-04	25	RPS-01-10	42	RPS-01-07	50	RPS-01-14	78	RPS-01-36
	NPW-01-01	28	RPS-91-29	43	RPS-91-04	80	RPS-01-58	1 77	RPS-01-39
10	NPS-01-06	27	RPS-01-06	44	RPS-01-16	61	RPS-01-50	78	RPS-01-40
		26	RPS-01-23	45	RPS-01-11	62	RPS-01-48	79	RPS-01-41
11	NPS-91-09			46	RPS-01-64	63	RPS-91-49	80	RPS-01-42
12	NPS-91-10	29	RPS-01-24			1	RPS-01-50	31	RPS-01-43
13	RPS-01-01	30	RPS-01-25	47	RPS-01-05	64		1 22	RPS-01-15
14	RPS-91-02	31	RPS-91-09	46	RPS-91-66	65	RPS-91-13	- E2	IA.9-61-19
15	RPW-91-01	32	RPS-01-26	40	RP8-01-67	66	RPS-91-51	1	
16	RPW-91-02	33	RPS-91-27	50	RPS-91-66	67	RPS-01-52		
17	RPS-91-03	34	RPS-01-05	51	RPS-01-54	66	RPS-01-63	1	



PAVED ROAD OR TRAMWAY DRAINAGE DITCH

81119 - EXISTING MONITORING WELLS

RPM-89-02 - NEW MONITORING WELLS

▲ SEDIMENT SAMPLE

△ SURFACE SOIL SAMPLE

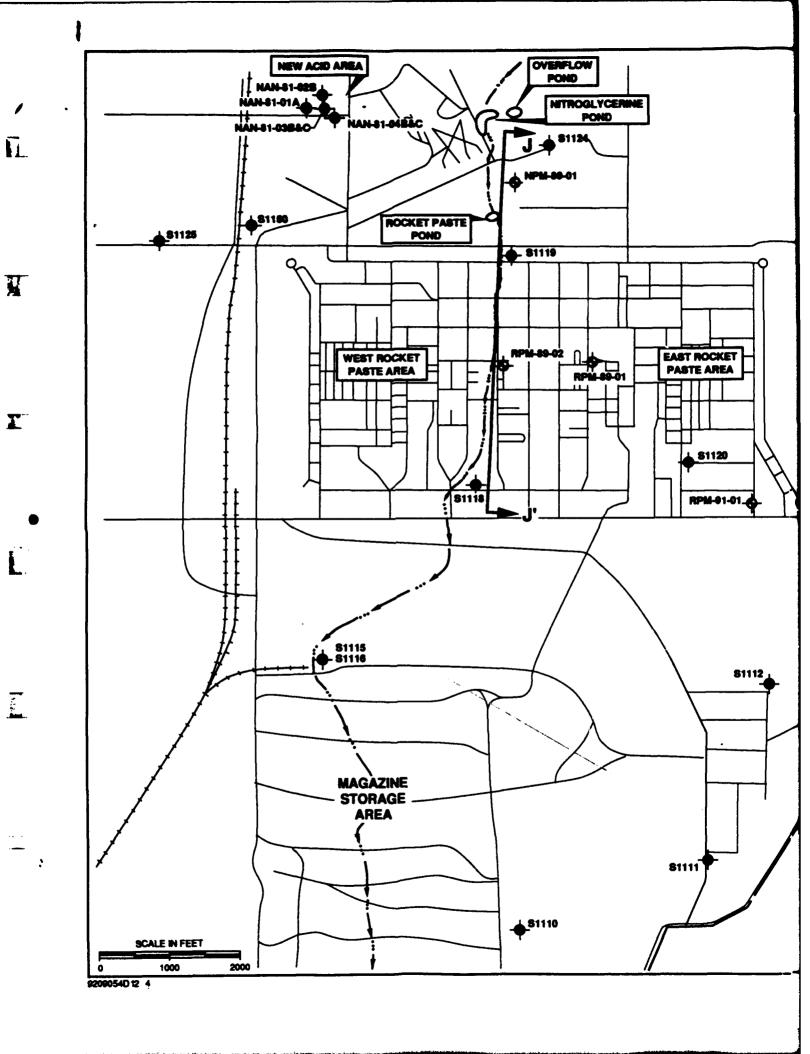
☐ SURFACE WATER SAMPLE

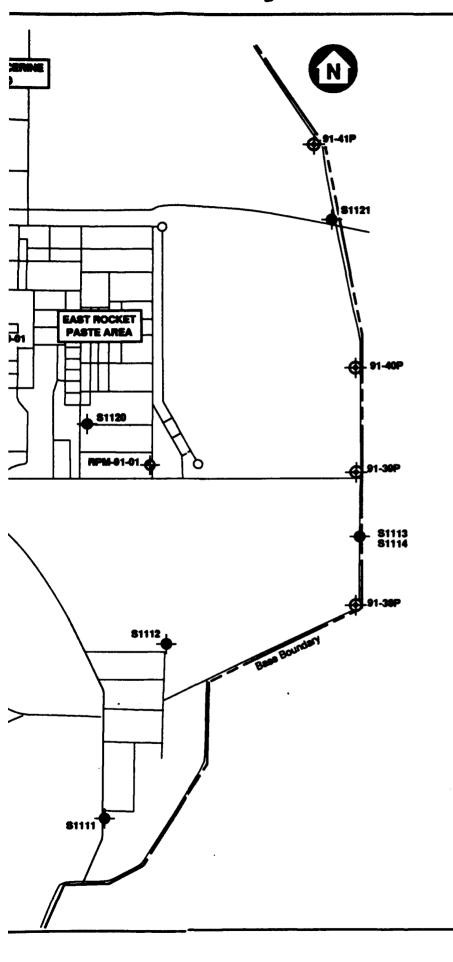
NOTES:

- 1. BASE MAP FROM 300 SCALE SITE TOPOGRAPHIC PLAN PROVIDED BY OLIN CORPORATION.
- 2. S1100 SERIES AND 81 SERIES WELL LOCATIONS BASED ON MEP (TSAI, 1986)
- 3. 1989 AND 91 SERIES WELL LOCATIONS BASED ON VIERBICHER SURVEY DATA (APPENDIX F).
- 4. SURFACE SOIL AND SURFACE WATER SAMPLE LOCATIONS BASED ON FIELD SURVEY CONDUCTED BY ABB-ES.

FIGURE 8-1
SITE LOCATION PLAN AND
SEDIMENT, SURFACE SOIL AND
SURFACE WATER SAMPLE LOCATIONS
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.





PAVED ROAD OR TRAMWAY

DRAINAGE DITCH

S1119 EXISTING MONITORING WELL LOCATION AND DESIGNATION

NEW MONITORING WELL LOCATION AND DESIGNATION

NEW FUDS PIEZOMETER LOCATION AND DESIGNATION

ORIENTATION OF GEOLOGIC CROSS SECTION

NOTES:

- 1. BASE MAP FROM 300 SCALE SITE TOPOGRAPHIC PLAN PROVIDED BY OLIN CORPORATION.
- 2. S1100 SERIES AND 81 SERIES WELL LOCATIONS BASED ON MEP (TSAI, 1986).
- 3. 1989 AND 91 SERIES WELL LOCATIONS BASED ON VIERBICHER SURVEY DATA (APPENDIX F).
- 4. NEW MONITORING WELLS INSTALLED UNDER THE DIRECTION OF ABB-ES.
- 8. EXISTING MONITORING WELLS INSTALLED UNDER THE DIRECTION OF OUR CORPORATION.
- 6. FUDS PIEZOMETERS INSTALLED UNDER THE DIRECTION OF COE ST. PAUL DISTRICT.

FIGURE MONITORING WELL LOCATIONS
ORIENTATION OF GEOLOGIC CROSS SECTION OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE

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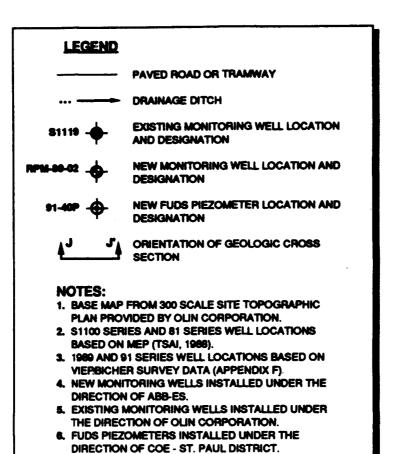
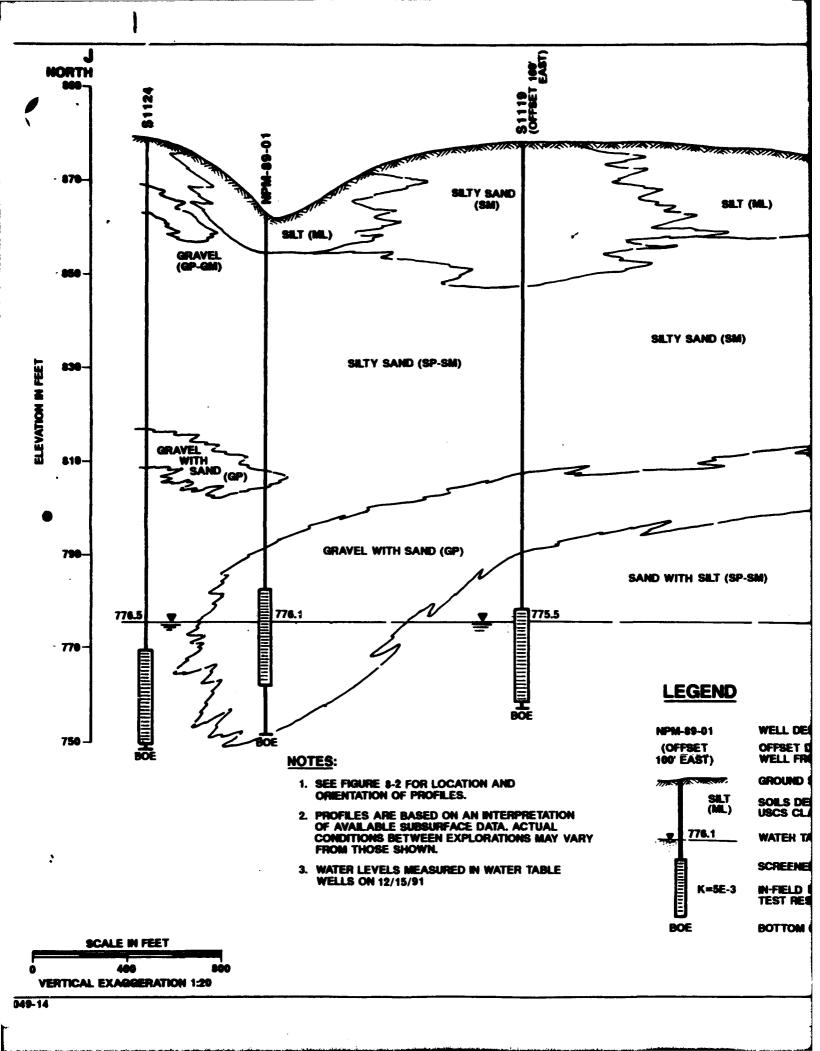
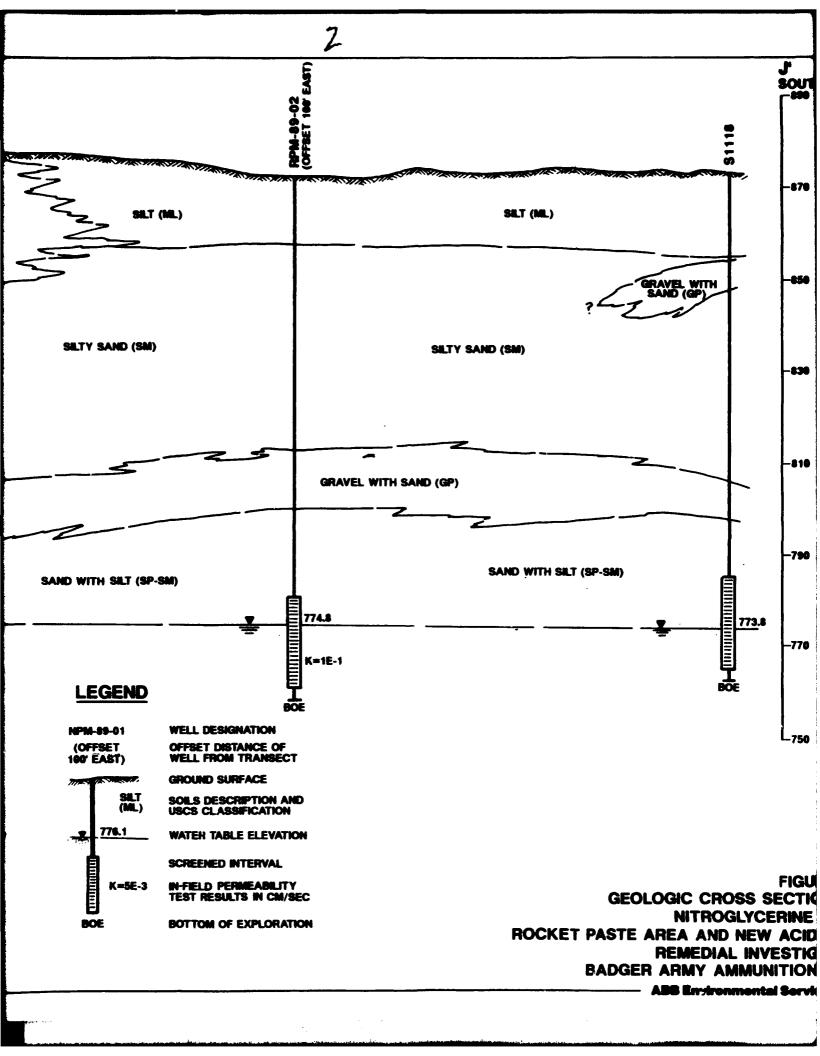
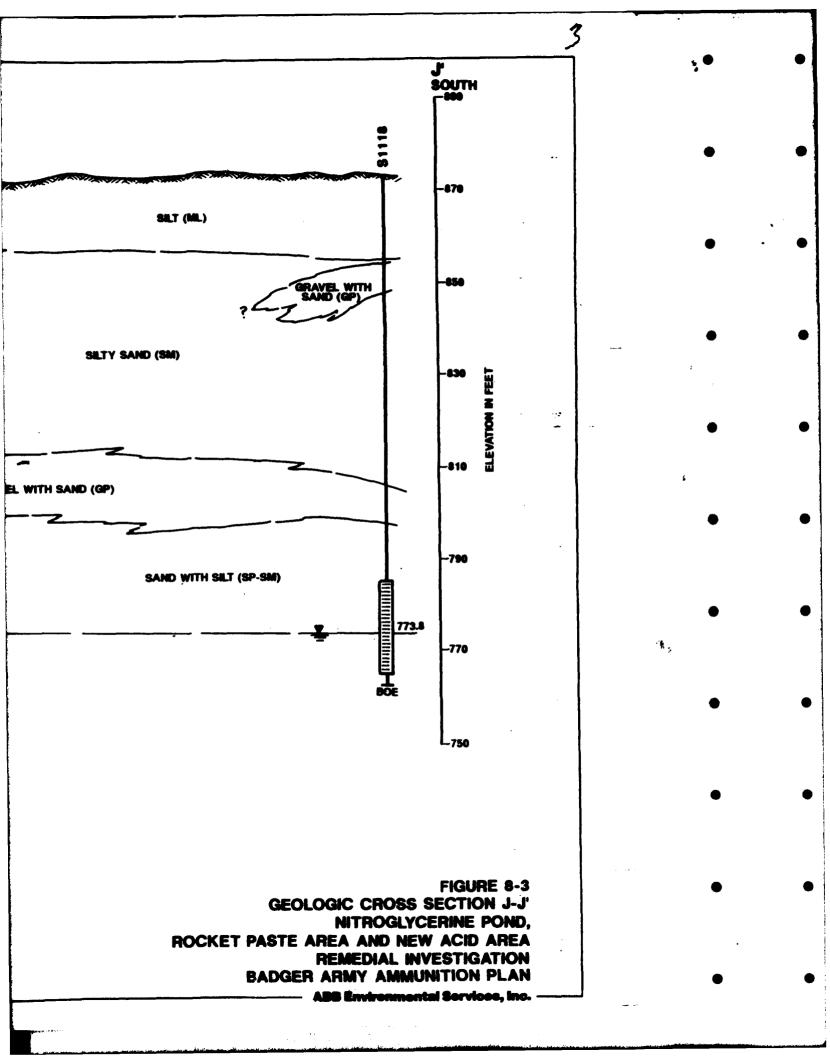


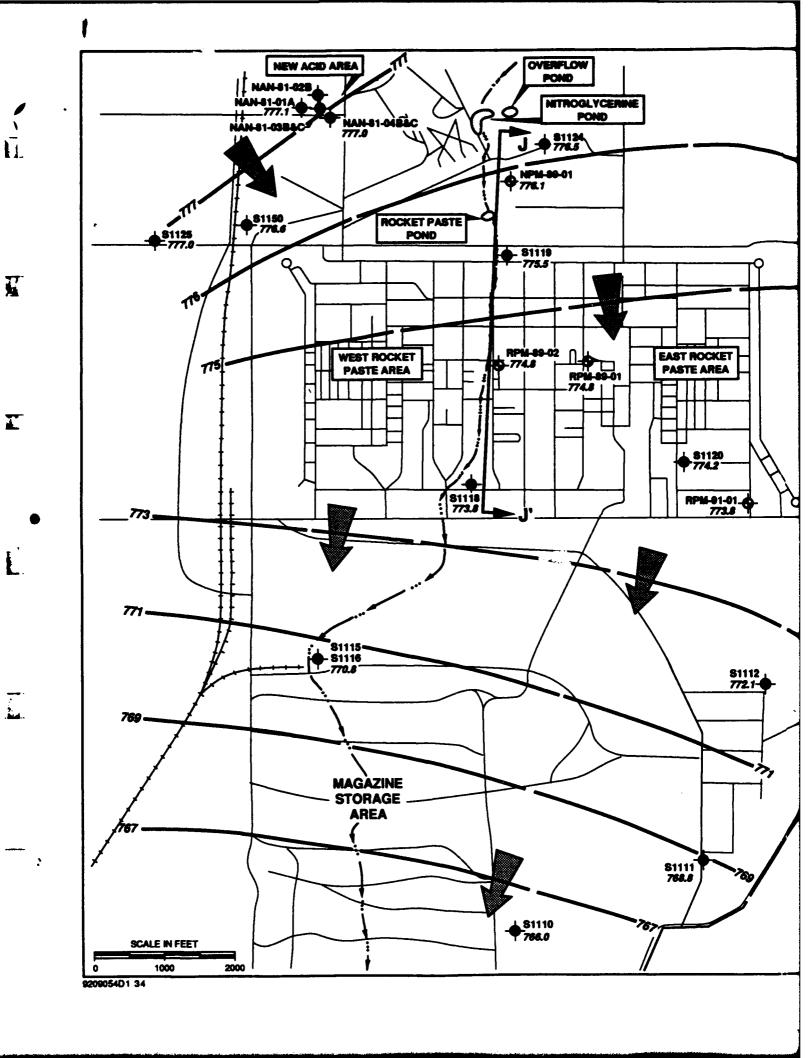
FIGURE 8-2
MONITORING WELL LOCATIONS AND
ORIENTATION OF GEOLOGIC CROSS SECTION J-J'
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

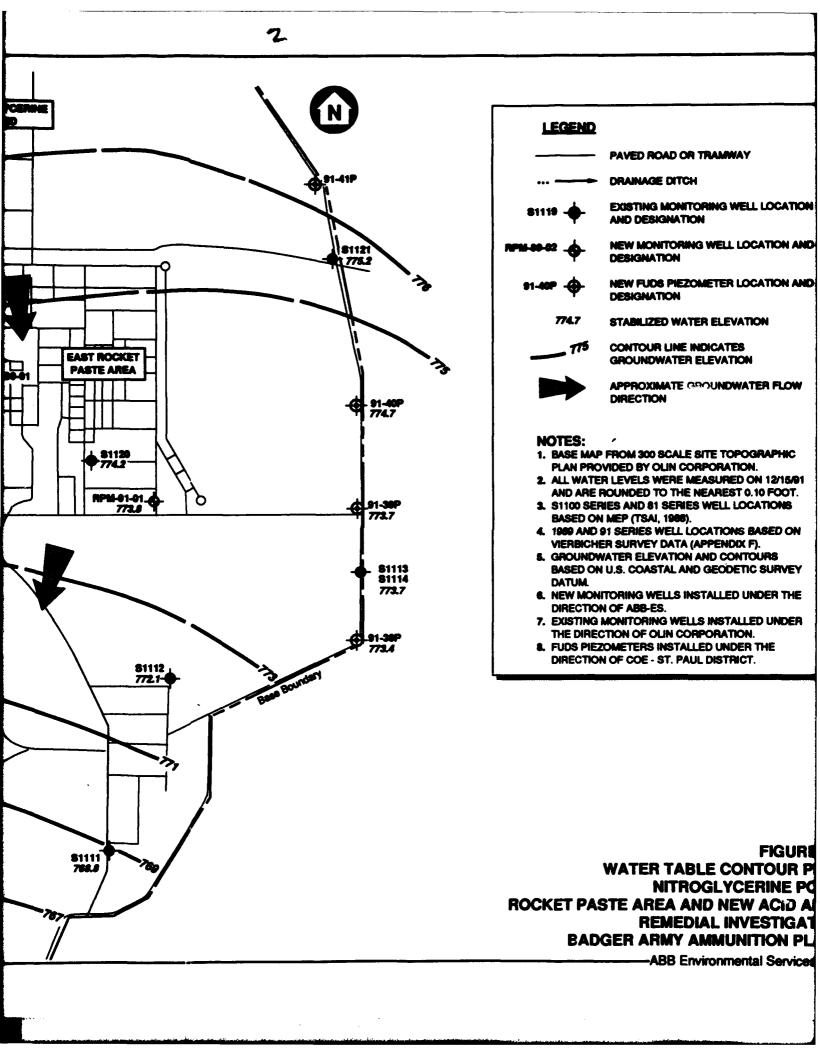
-ABB Environmental Services, Inc.

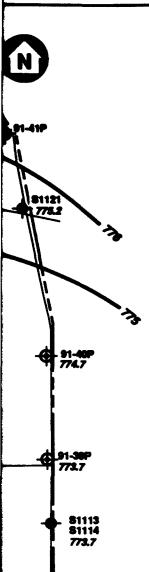




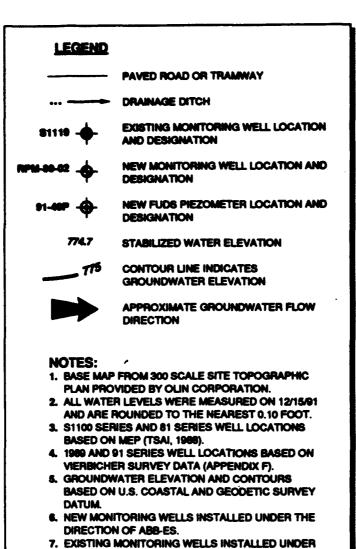








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THE DIRECTION OF OLIN CORPORATION.

8. FUDS PIEZOMETERS INSTALLED UNDER THE

DIRECTION OF COE - ST. PAUL DISTRICT.

FIGURE 8-4
WATER TABLE CONTOUR PLAN
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.

NITROGLYCER POND OVERFLOW POND MAN-81-00B,C Fermer New Acid Lagoon ROCKET PASTE FOND 81119 WEST ROCKET PASTE AREA SCALE IN FEET 1600 800

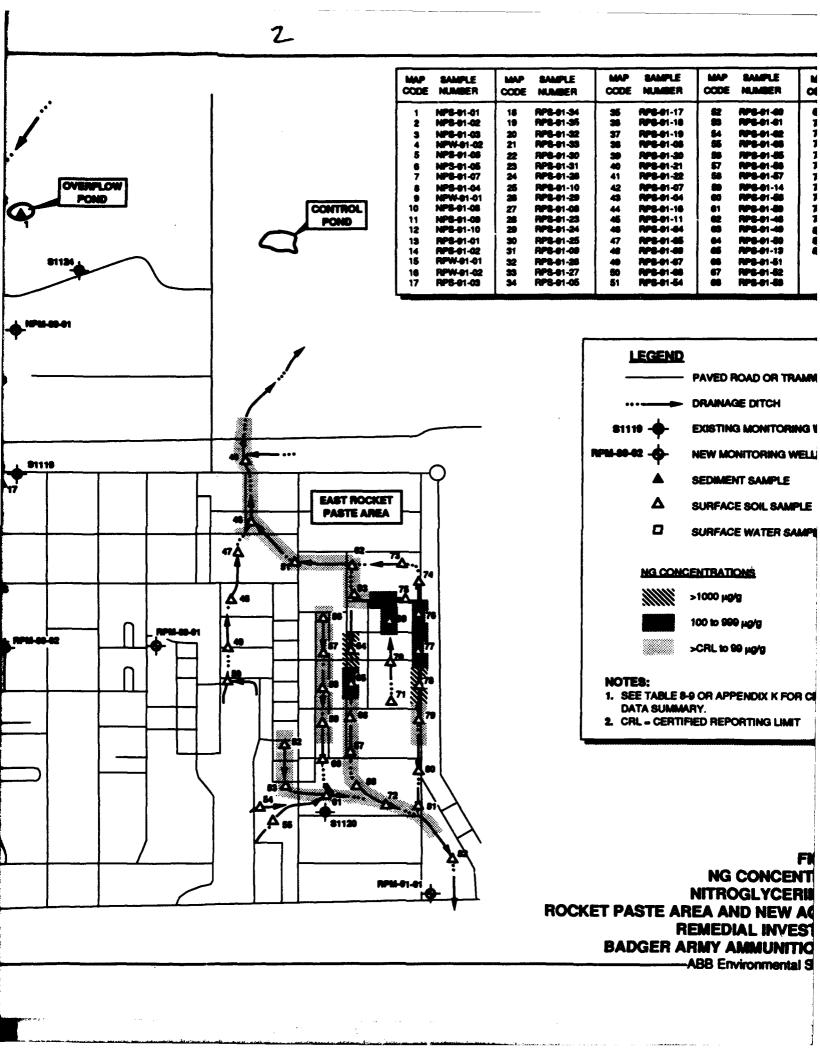
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CODE	SAMPLE NUMBER	MAP	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	RAMPLE NUMBER	MAP CODE	SAMPLE NUMBER
1	NPS-91-01	18	RPS-01-34	36	RPS-01-17	52	RPS-01-00	-	RPS-01-12
2	NPS-01-02	19	RPS-01-35	36	RPS-01-18	55	RPS-01-61	70	RPS-01-45
3	NPS-01-03	20	RPS-91-32	37	RPS-01-19	54	RPS-01-42	[71	RPS-01-46
4	NPW-91-02	21	RPS-01-33	36	RPS-81-06	55	RPS-01-63	72	RPS-01-47
5	NPS-01-06	22	RPS-01-30	39	RPS-01-20	56	RPS-01-55	73	RPS-01-36
8	NPS-01-06	23	RPS-01-31	40	RPS-01-21	57	RPS-01-56	74	RPS-01-37
7	NPS-01-07	24	RPS-01-28	41	RPS-01-22	58	RPS-01-57	75	RPS-01-44
À	NPS-91-04	25	RPS-91-10	42	RPS-01-07	59	RPS-01-14	76	RPS-01-36
9	NPW-01-01	26	RPS-01-29	43	RPS-01-04	60	RPS-01-56	77	RPS-01-30
10	NPS-01-06	27	RPS-01-08	44	RPS-01-16	61	RPS-01-50	78	RP8-01-40
11	NPS-01-00	28	RPS-01-23	45	RPS-01-11	62	RPS-01-46	79	RPS-01-41
12	NPS-01-10	29	RPS-01-24	46	RPS-01-64	63	RPS-01-40	80	RPS-01-42
13	RPS-01-01	30	RPS-01-25	47	RPS-01-05	64	RPS-01-50	81	RPS-01-43
14	RPS-01-02	31	RPS-01-00	48	RPS-01-06	65	RPS-01-13	82	RPS-01-15
15	RPW-01-01	32	RPS-01-26	40	RPS-01-67	86	RPS-01-51	1	
16	RPW-91-02	33	RPS-01-27	50	RPS-01-06	67	RPS-01-52	1	
17	RPS-01-03	34	RPS-01-05	51	RPS-01-54	86	RPS-01-53	1	

NG CONCENTRATIONS

IIIII.

>1000 µg/g



100 to 999 µg/g

SURFACE WATER SAMPLE



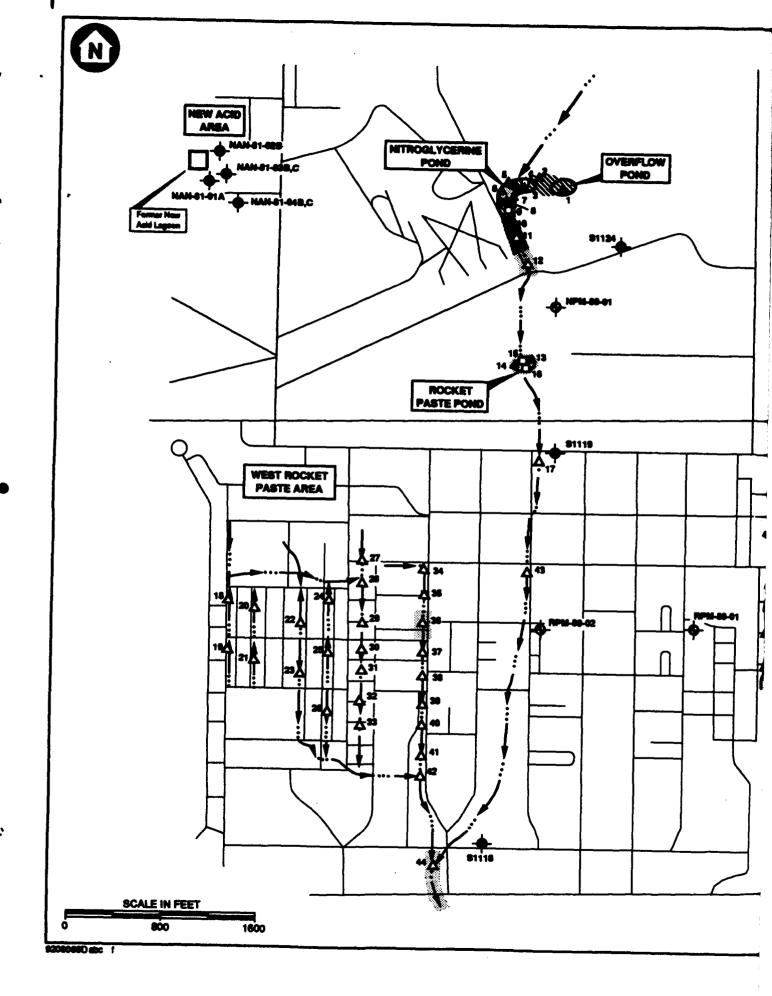
>CRL to 99 µg/g

NOTES:

- 1. SEE TABLE 8-9 OR APPENDIX K FOR CHEMICAL DATA SUMMARY.
- 2. CRL CERTIFIED REPORTING LIMIT

FIGURE 8-5
NG CONCENTRATIONS
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.



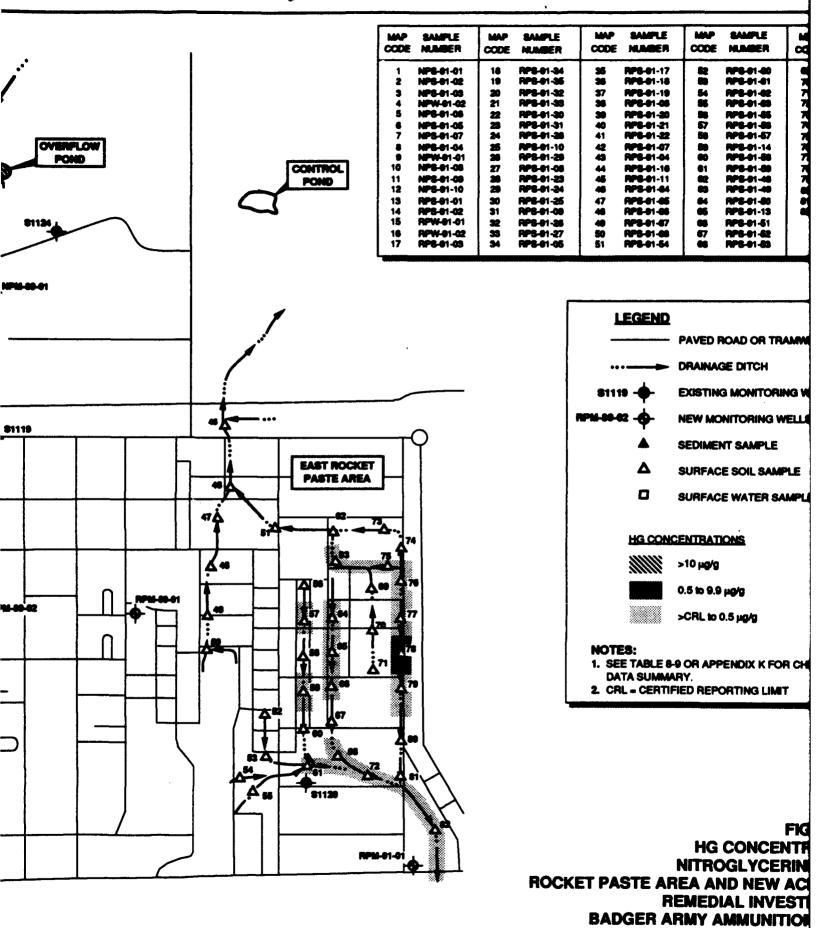
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MAP CODE	SAMPLE NUMBER	MAP	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER
1	NPS-91-01	10	RPS-91-34	36	RPS-01-17	52	RPS-01-00	60	RPS-01-12
2	NPS-01-02	19	RPS-01-35	36	RPS-91-18	53	RPS-01-61	70	RPS-01-45
3	NPS-91-03	20	RPS-91-32	37	RPS-91-19	54	RPS-01-62	71	RPS-91-46
4	NPW-91-02	21	RPS-01-33	36	RPS-01-06	55	RPS-01-63	72	RPS-91-47
5	NPS-01-06	22	RPS-01-30	300	RPS-01-20	56	RPS-01-55	73	RPS-01-36
6	NPS-01-05	23	RPS-01-31	40	RPS-01-21	57	RPS-01-56	74	RPS-01-37
7	NPS-01-07	24	RPS-01-28	41	RPS-01-22	58	RPS-91-57	75	RPS-01-44
	NPS-01-04	25	RPS-01-10	42	RPS-01-07	59	RPS-01-14	78	RPS-01-30
ě	NPW-01-01	26	RPS-01-29	43	RPS-91-04	80	RPS-01-58	77	RPS-01-30
10	NPS-01-06	27	RPS-01-06	1 44	RPS-01-16	61	RPS-01-50	78	RP8-01-40
11	NPS-01-00	28	RPS-01-23	45	RPS-01-11	62	RPS-01-48	79	RPS-01-41
12	NPS-01-10	29	RPS-01-24	46	RPS-01-64	83	RPS-01-40	80	RPS-01-42
13	RPS-01-01	30	RPS-91-25	47	RPS-91-65	64	RPS-01-50	81	RPS-01-43
14	RPS-91-02	31	RPS-01-00	48	RPS-01-66	65	RPS-01-13	82	F:P8-01-15
15	RPW-01-01	32	RPS-01-26	49	RPS-01-67	86	RPS-01-51		
16	RPW-01-02	33	RPS-01-27	50	RPS-01-66	67	RPS-91-52		
17	RPS-91-03	34	RPS-91-05	51	RPS-01-54	66	RPS-01-53		

LEGEND

PAVED ROAD OR TRAMWAY

----- DRAINAGE DITCH

1119 - EXISTING MONITORING WELLS

1-89-02 - NEW MONITORING WELLS

▲ SEDIMENT SAMPLE

△ SURFACE SOIL SAMPLE

☐ SURFACE WATER SAMPLE

HG CONCENTRATIONS

>10 µg/g



0.5 to 9.9 µg/g



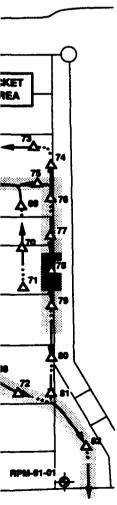
>CRL to 0.5 µg/g

NOTES:

- 1. SEE TABLE 8-9 OR APPENDIX K FOR CHEMICAL DATA SUMMARY.
- 2. CRL CERTIFIED REPORTING LIMIT

FIGURE 8-6
HG CONCENTRATIONS
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.



NEW ACID AREA NITROGLYCERII POND OVERFLOW POND MAN-81-058,C ROCKET PASTE POND **\$1119** WEST ROCKET PASTE AREA 81118 SCALE IN FEET 800 1600 9200000D abc e

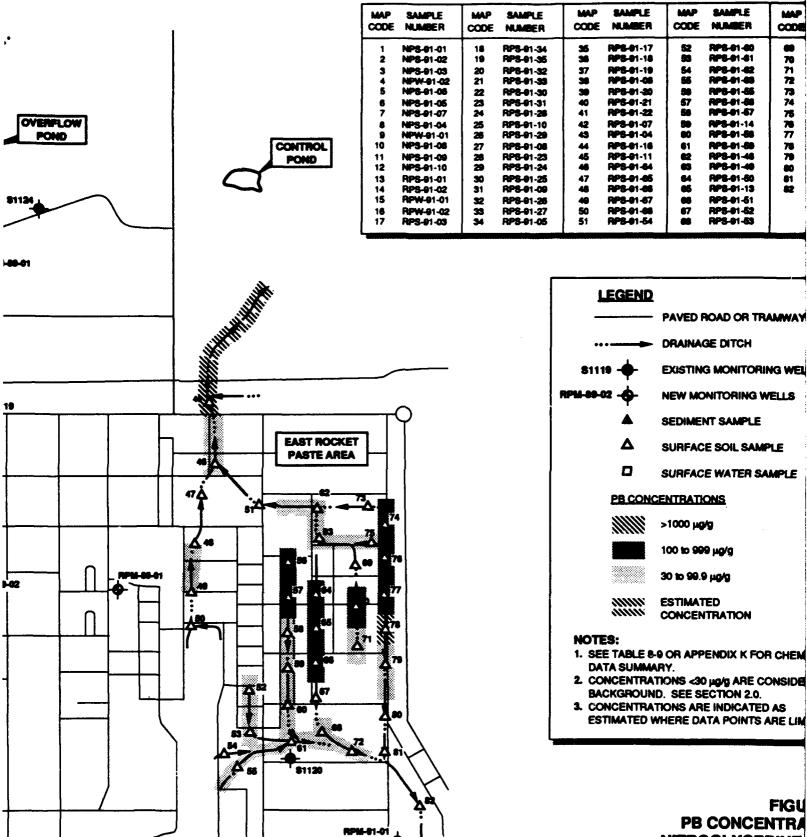
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FIGU PB CONCENTRA **NITROGLYCERINE ROCKET PASTE AREA AND NEW ACID** REMEDIAL INVESTIG **BADGER ARMY AMMUNITION**

-ABB Environmental Serv

MP

CODE

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71 72

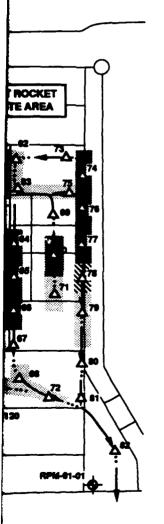
73 74

75 76 77

76 70

80

MAP	SAMPLE	MAP	SAMPLE	MAP	SAMPLE	MAP	SAMPLE	MAP	SAMPLE
CODE	NUMBER	CODE	NUMBER	CODE	NUMBER	CODE	NUMBER	CODE	NUMBER
1	NPS-01-01	18	RPS-91-34	36	RP8-01-17	52	RPS-91-60	80	RPS-01-12
2	NPS-91-02	19	RPS-01-35	36	RPS-01-18	53	RPS-91-61	70	RPS-01-45
3	NPS-91-03	20	RPS-01-32	37	RPS-91-19	54	RPS-01-02	71	RPS-01-46
4	NPW-91-02	21	RPS-91-33	36	RP8-01-06	55	RPS-91-65	72	RPS-01-47
5	NPS-91-06	22	RPS-91-30	39	RPS-01-20	56	RPS-01-55	73	RPS-01-36
6	NPS-91-05	23	RPS-91-31	40	RPS-01-21	57	RPS-01-66	74	RPS-01-37
7	NPS-01-07	24	RPS-91-26	41	RP8-01-22	58	RPS-01-57	75	RPS-01-44
8	NPS-01-04	25	RPS-91-10	42	RPS-01-07	50	RPS-01-14	76	RPS-01-36
9	NPW-01-01	26	RPS-01-29	43	RPS-01-04	60	RPS-01-58	177	RPS-01-30
10	NPS-91-06	27	RPS-91-06	44	RP8-91-16	61	RP8-01-50	78	RP8-01-40
11	NPS-91-09	28	RPS-91-23	45	RPS-01-11	62	RPS-01-48	79	RPS-01-41
12	NPS-91-10	29	RPS-91-24	46	RPS-01-64	63	RPS-01-40	80	RPS-01-42
13	RPS-91-01	30	RPS-91-25	47	RPS-91-86	64	RPS-91-50	81	RPS-01-43
14	RPS-91-02	31	RPS-01-09	48	RPS-91-66	65	RPS-91-13	82	RP8-01-15
15	RPW-91-01	32	RPS-91-26	40	RP8-91-67	86	RPS-01-51	_	10
16	RPW-01-02	33	RPS-91-27	50	RP8-01-86	67	RPS-01-52		
17	RPS-01-03	34	RPS-91-05	51	RPS-01-54	66	RPS-91-53	ſ	



PAVED ROAD OR TRAMWAY DRAINAGE DITCH S1119 EXISTING MONITORING WELLS NEW MONITORING WELLS SEDIMENT SAMPLE SURFACE SOIL SAMPLE SURFACE WATER SAMPLE PB CONCENTRATIONS >1000 µg/g 100 to 999 µg/g 30 to \$9.9 µg/g ESTIMATED CONCENTRATION

NOTES:

- 1. SEE TABLE 8-9 OR APPENDIX K FOR CHEMICAL DATA SUMMARY.
- 2. CONCENTRATIONS <30 µg/g ARE CONSIDERED BACKGROUND. SEE SECTION 2.0.
- 3. CONCENTRATIONS ARE INDICATED AS ESTIMATED WHERE DATA POINTS ARE LIMITED.

FIGURE 8-7
PB CONCENTRATIONS
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.-

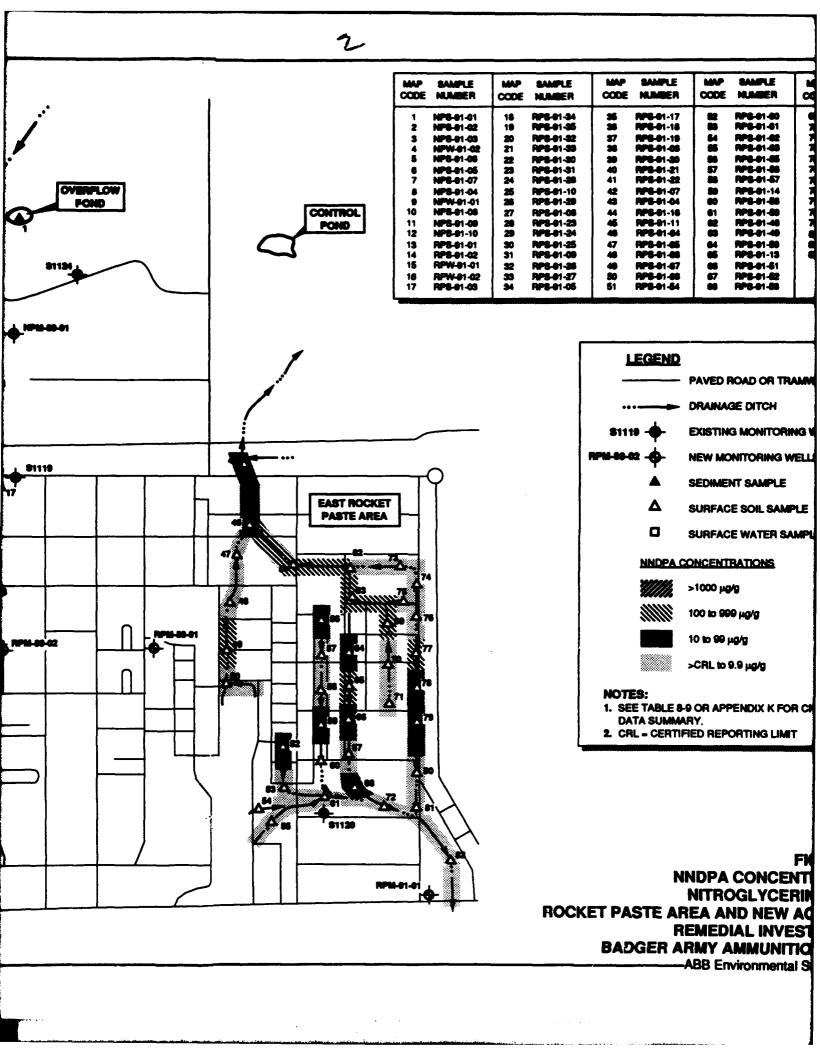
NITROGLYCERINE POND OVERFLOW POND ROCKET PASTE POND \$1119 WEST ROCKET PASTE AREA 443 81118 SCALE IN FEET 800 1600 92000000 abc h

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MAP CODE	SAMPLE NUMBER	MAP	SAMPLE NUMBER	MAP	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER
	NPS-91-01	18	RPS-01-34	35	RPS-01-17	52	RPS-01-00	-	RPS-01-12
2	NPS-01-02	19	RPS-91-35	35	RPS-01-18	5 3	RPS-01-61	70	RPS-01-45
-		1				54	RPS-01-02	1 77	RPS-01-46
3	NPS-01-03	20	RPS-01-32	37	RP8-01-19				RPS-01-47
4	NPW-01-02	21	RP8-01-33	30	RPS-01-06	55	RPS-01-03	72	
5	NPS-01-06	22	RPS-91-30	39	RP8-01-20	56	RPS-01-65	73	RP8-01-36
6	NPS-01-05	23	RPS-91-31	40	RPS-01-21	57	RPS-91-56	74	RPS-91-37
7	NPS-01-07	24	RPS-01-26	41	RPS-01-22	58	RP8-01-57	75	RPS-01-44
	NPS-01-04	25	RPS-01-10	42	RPS-01-07	59	RPS-01-14	76	RPS-01-36
•	NPW-91-01	28	RPS-01-29	43	RPS-01-04	80	RPS-91-58	77	RPS-01-30
10	NPS-91-08	27	RP8-01-08	44	RPS-01-16	61	RPS-01-50	78	RP8-01-40
	NPS-91-09	26	RPS-01-23	45	RPS-01-11	62	RPS-01-48	79	RP8-01-41
11				46	RPS-01-64	83	RPS-91-49		RPS-01-42
12	NPS-01-10	29	RPS-91-24					80	
13	RPS-91-01	30	RPS-01-25	47	RPS-01-65	64	RPS-91-50	81	RPS-01-43
14	RPS-01-02	31	RPS-01-09	48	RPS-91-86	65	RPS-01-13	82	RPS-01-15
15	RPW-91-01	32	RPS-91-26	49	RPS-01-67	96	RPS-91-51	1	
16	RPW-01-02	33	RPS-01-27	50	RPS-01-68	87	RPS-01-52	1	
17	RPS-01-03	34	RPS-91-05	51	RPS-01-54	8	RPS-01-53	I	

LEGEND

PAVED ROAD OR TRAMWAY

B1119 - EXISTING MONITORING WELLS

RPM-89-02 - NEW MONITORING WELLS

▲ SEDIMENT SAMPLE

△ SURFACE SOIL SAMPLE

SURFACE WATER SAMPLE

NNDPA CONCENTRATIONS

////// >1000 µg/g

100 to 999 μg/g

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10 to 99 μg/g
>CRL to 9.9 μg/g

NOTES:

DCKET

AREA

- SEE TABLE 8-9 OR APPENDIX K FOR CHEMICAL DATA SUMMARY.
- 2. CRL CERTIFIED REPORTING LIMIT

FIGURE 8-8
NNDPA CONCENTRATIONS
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.-

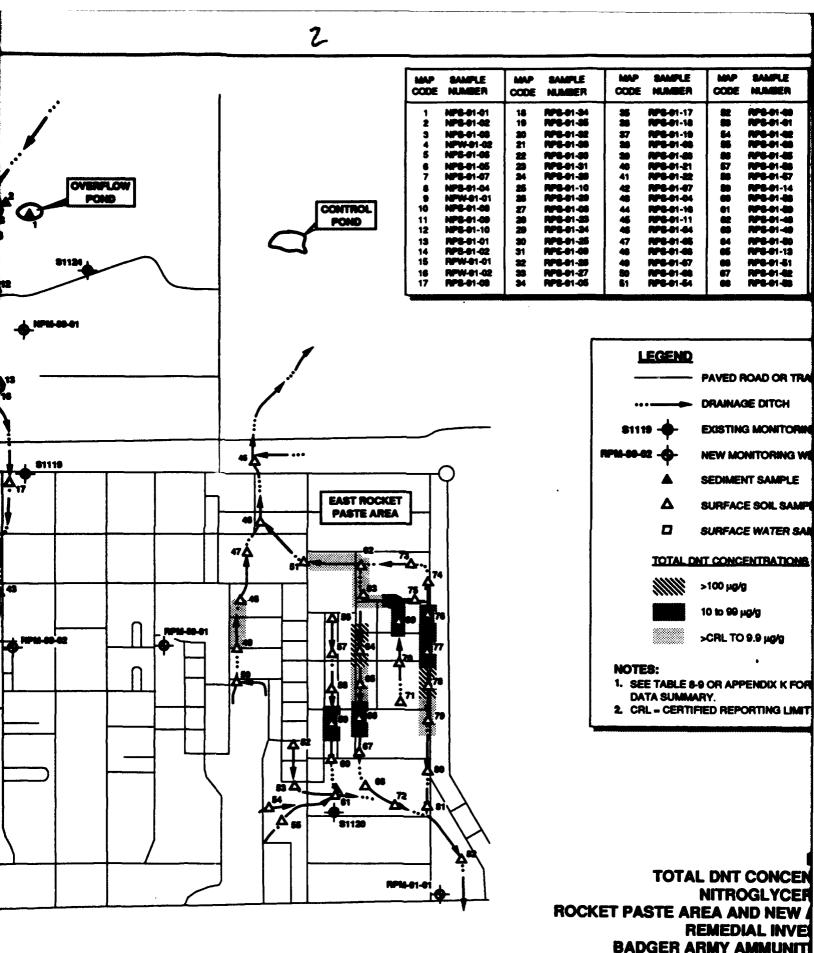
EW ACID AREA NITROGLYCERIN POND OVERFLOW POND NAME 1 458,C ROCKET PASTE POND \$1119 WEST ROCKET PASTE AREA 44 37 \$1118 SCALE IN FEET 1600 800 9200000Dabc g

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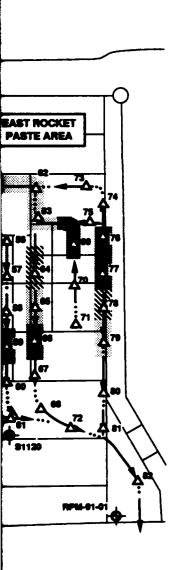


BADGER ARMY AMMUNIT

-ABB Environmental

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CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER
1	NPS-01-01	18	RPS-01-34	36	RPS-01-17	52	RPS-81-80	-	RPS-01-12
2	NP8-41-02	19	RPS-01-35	36	RPS-01-18	53	RPS-01-61	70	RP6-01-4
3	NPS-01-03	20	RPS-01-32	37	RPS-01-19	54	RPS-01-02	71	RPS-01-4
4	NPW-01-02	21	RPS-01-33	38	RPS-01-06	55	RPS-01-05	72	RPS-01-4
5	NPS-01-06	22	RPS-01-30	30	RPS-01-20	56	RPS-01-55	73	RPS-01-3
6	NPS-01-05	23	RPS-01-31	40	RPS-01-21	57	RPS-01-56	74	RPS-01-3
7	NPS-01-07	24	RPS-01-28	41	RPS-01-22	58	RPS-01-57	75	RPS-01-4
	NPS-01-04	25	RP8-01-10	42	RPS-01-07	50	RPS-01-14	78	RPS-01-3
•	NPW-01-01	3	RPS-01-29	43	RPS-01-04	60	RPS-01-58	77	RPS-01-3
10	NPS-01-08	27	RPS-01-08	44	RPS-01-16	61	RPS-01-80	76	RPS-01-4
11	NPS-01-00	28	RPS-01-23	46	RPS-01-11	62	RPS-01-48	79	RPS-01-4
12	NPS-01-10	29	RPS-01-24	46	RPS-01-64	63	RPS-01-40	80	RPS-01-4
13	RPS-01-01	30	RPS-01-25	47	RPS-01-05	64	RPS-91-50	81	RPS-01-4
14	RPS-01-02	31	RPS-01-00	44	RPS-01-06	65	RPS-01-13	82	RPS-01-1
15	RPW-91-01	32	RPS-01-25	40	RPS-01-67		RPS-01-51	1	
16	RPW-01-02	35	RPS-01-27	50	RPS-01-06	67	RPS-01-52	1	
17	RPS-01-03	34	RPS-01-05	51	RPS-01-54		RPS-01-53	1	



POND

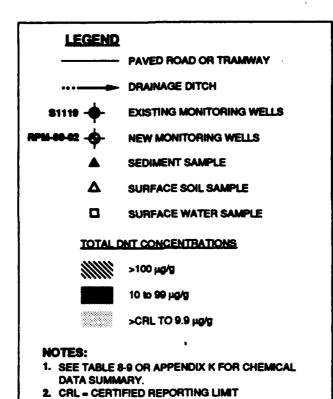


FIGURE 8-9
TOTAL DNT CONCENTRATIONS
NITROGLYCERINE POND,
ROCKET PASTE AREA AND NEW ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

—ABB Environmental Services, Inc.

EW ACID NITROGLYCER POND POND 4378 ROCKET PASTE POND \$1119 WEST ROCKET PASTE AREA 1 427 4 34 44 231 SCALE IN FEET 1600 800 92000000 abc

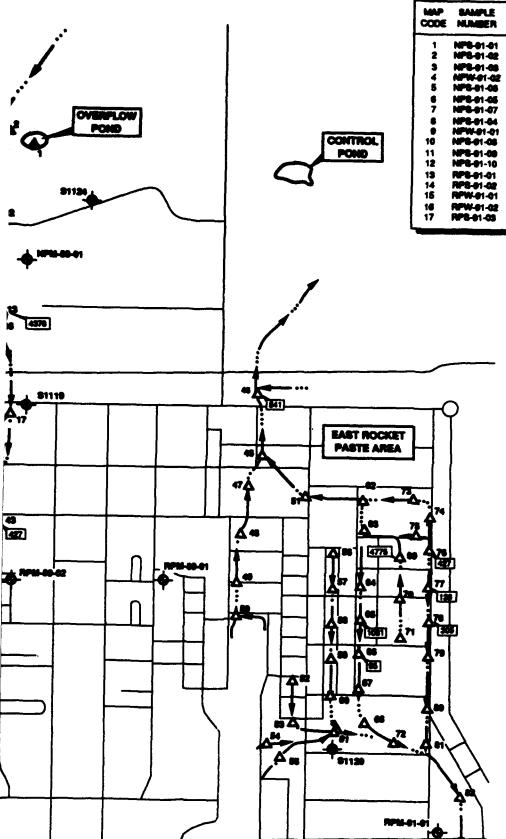
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CODE	SAMPLE NUMBER	MAP	SAMPLE NUMBER	CODE	BAMPLE NUMBER	MAP	SAMPLE NAMES
1 2 3 4 5 6 7 8 8 10 11 12 13	NPS-01-01 NPS-01-05 NPS-01-05 NPS-01-05 NPS-01-05 NPS-01-07 NPS-01-04 NPW-01-01 NPS-01-06 NPS-01-06 NPS-01-00 NPS-01-01	18 19 20 21 22 23 24 25 26 27 28 29 30	RPS-01-34 RPS-01-35 RPS-01-32 RPS-01-33 RPS-01-30 RPS-01-30 RPS-01-30 RPS-01-30 RPS-01-30 RPS-01-35 RPS-01-35 RPS-01-35	35 36 37 38 39 40 41 42 49 44 46 46 47	RPS-01-17 RPS-01-18 RPS-01-08 RPS-01-09 RPS-01-20 RPS-01-22 RPS-01-07 RPS-01-04 RPS-01-16 RPS-01-11 RPS-01-04 RPS-01-04	S2 39 54 55 50 50 50 60 61 62 66 64	MAMER RPS-01-00 RPS-01-01 RPS-01-02 RPS-01-05 RPS-01-05 RPS-01-05 RPS-01-14 RPS-01-10 RPS-01-10 RPS-01-40 RPS-01-40
14 15 16 17	RPS-01-02 RPW-01-01 RPW-01-02 RPS-01-03	31 32 35 34	RPS-01-00 RPS-01-25 RPS-01-27 RPS-01-05	46 40 50 51	RPS-01-05 RPS-01-07 RPS-01-06 RPS-01-54	66 67 68	RPS-01-13 RPS-01-51 RPS-01-62 RPS-01-68

PAVED ROAD OR TRA

DRAINAGE DITCH

S1119 DEXISTING MONITORING

RPM-80-82 DEMINITORING WE

A SEDIMENT SAMPLE

DESCRIPTION OF THE SAMPLE

SURFACE WATER SAMPLE

BT PB CONCENTRATION OF (1971)

NOTES:

1. SEE TABLE 8-9 OR APPENDIX K FOR DATA SUMMARY.

TCLP PB CONCEN
NITROGLYCER
ROCKET PASTE AREA AND NEW A
REMEDIAL INVE
BADGER ARMY AMMUNIT

-ABB Environmental

MAP CODE	SAMPLE NUMBER	MAP	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER	CODE	SAMPLE NUMBER
1	NPS-01-01	18	RPS-01-34	35	RPS-01-17	52	RPS-91-60	•	RPS-01-12
2	NPS-91-02	19	RP8-01-35	36	RPS-01-18	53	RPS-01-61	70	RPS-01-45
3	NPS-01-03	20	RPS-01-32	37	RPS-01-19	54	RPS-01-62	71	RPS-01-46
Ā	NPW-01-02	21	RPS-01-33	36	RPS-01-06	56	RPS-01-63	72	RP8-91-47
5	NPS-01-06	22	RPS-01-30	30	RPS-01-20	56	RPS-01-55	73	RPS-01-36
Ā	NPS-01-05	23	RPS-01-31	40	RPS-01-21	57	RPS-91-56	74	RP8-01-37
7	NPS-01-07	24	RPS-01-26	41	RPS-01-22	58	RPS-01-57	75	RPS-01-44
•	NPS-91-04	25	RPS-01-10	42	RPS-01-07	50	RPS-01-14	76	RPS-01-36
	NPW-01-01	28	RPS-01-29	43	RPS-01-04	80	RPS-01-56	77	RPS-01-30
10	NPS-01-06	27	RPS-01-06	44	RPS-01-16	61	RPS-01-50	78	RPS-01-40
11	NPS-01-00	28	RPS-91-23	45	RPS-01-11	82	RPS-01-46	79	RPS-01-41
12	NPS-01-10	29	RPS-01-24	46	RPS-91-64	63	RPS-01-40	80	RPS-01-42
13	RPS-91-01	30	RP8-91-25	47	RPS-01-65	64	RPS-01-50	81	RPS-01-43
14	RPS-01-02	31	RPS-01-00	48	RPS-01-06	86	RPS-01-13	82	RPS-01-15
15	RPW-01-01	32	RPS-01-25	40	RPS-01-67	8	RPS-91-51		
16	RPW-01-02	33	RPS-91-27	50	RPS-01-00	67	RPS-01-52	1	
17	RPS-01-03	34	RPS-91-05	51	RPS-01-54	88	RPS-01-53	1	

LEGEND

PAVED ROAD OR TRAMWAY

DRAINAGE DITCH

EXISTING MONITORING WELLS

NEW MONITORING WELLS

SEDIMENT SAMPLE

SURFACE SOIL SAMPLE

SURFACE WATER SAMPLE

PB CONCENTRATION IN SAMPLE 91 $(\mu g/L)$

NOTES:

NOCKET

E AREA

138

1. SEE TABLE 8-9 OR APPENDIX K FOR CHEMICAL

DATA SUMMARY.

FIGURE 8-10 TCLP PB CONCENTRATIONS NITROGLYCERINE POND, ROCKET PASTE AREA AND NEW ACID AREA REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.-

TABLE 9-1
SUMMARY OF THE REMEDIAL INVESTIGATION FIELD PROGRAM OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

			PROGRAM ELEMENTS	ø	
Sites	SOIL VAPOR SURVEY	REMOTE SENŠING GEOPHYSICS	MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING*	Soil Borings And Soil Sampling	SEDIMENT, SURFACE SOIL, AND SURFACE WATER SAMPLING
Oleum Plant and Oleum Plant Pond	!	;	3 new wells; 10 samples from 3 new and 2 existing wells	5 deep borings, 24 analytical samples; 8 shallow borings; 22 analytical samples	10 sediment samples 5 surface water samples
Ballistics Pond	-	:	4 samples from existing wells	;	1

Notes:

* includes 2 rounds of groundwater sampling

TABLE 9-2
SUMMARY OF BORINGS COMPLETED OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

BORING NUMBER	DEPTH OF SOIL BORING FROM GROUND SURFACE (#)	TOTAL NUMBER OF SPLIT-SPOON SAMPLES	NUMBER OF SUBSURFACE SOIL SAMPLES FOR CHEMICAL ANALYSIS	PURPOSE
Oleum Plant				
OPB-91-01 ¹	99	S	4	This deep boring was drilled at the former bulk sulfur storage area to characterize the type and vertical distribution of residual contamination.
OPB-91-06	12	8	8	
OPB-91-07	12	က	e	
OPB-91-08	=	က	ဇ	These shallow borings were drilled in and
OPB-91-09	12	က	၉	around the Oreum Flam production facilities. The samples from these shallow borings will be
OPB-91-10	€0	2	2	used to characterize the vertical and areal extent of potential shallow soil contamination at
OPB-91-11	12	က	3	the Oleum Plant production facility
OPB-91-12	10	က	e	
OPB-91-13	6	2	2	
Oleum Plant and Pond				These deep borings were drilled in the Oleum Plant Pond. They are located near the
OPB-91-02	89	10	S	presumed outrail (02), at the edge of the pond (03), and near the edge of the apparent high
OPB-91-03	101	14	2	waterline (04 and 05). These borings will be used in conjunction with sediment samples to
OPB-91-04	35	13	ស	characterize the areal and vertical distribution of
OPB-91-05	93	13	5	residual son contarnination below the pond.

¹OPB-91-01 was first drilled using a hollow-stem auger. Boring encountered refusal at 12 feet, 7 feet, 5 feet. The buring was completed using the THEr ulive through cashiy technique. Notes:

TABLE 9-3
SUMMARY OF MONITORING WELLS INSTALLED OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITE AND WELL	CONTRACTOR ON I HAD	BORING DEPTH FROM GROUND	BOTTOM ELEVATION OF SCREENS	LENGTH OF WELL SCREEN	•	
Oleum Plant and Oleum Plant Pond	Oleum Plant Pond	(m;) (m;)	(A. MOL)	(4.7)	LOCATION	PURPOSE
OPM-89-01	Drill through casing hammer	88	837.8	82	Downgradient and southeast of the former sulfur storage area and old lagoon.	To provide horizontal definition of any potential plumes associated with the former sulfur storage or lagoon area.
OPM-89-02	Drill through casing hammer	118	764.6	ଷ	Downgradient and approximately 600 feet southeast of the Oleum Plant.	To provide horizontal definition of any potential plumes from the Oleum Plant Pond.
OPM-89-03	Drill through casing hammer	162	765.7	ୟ	Downgradient and approximately 1,200 feet southeast of the Oleum Plant.	To provide horizontal definition of any potential plumes from the Oleum Plant.

Notes:

= Mean Sea Level

MSL

W0039213T.9/3

TABLE 9-4 WELLS INCLUDED IN GROUNDWATER SAMPLING PROGRAM OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITES	NEW WELLS	EXISTING WELLS
Oleum Plant and Oleum Plant	OPM-89-01	\$1132
Pond	OPM-89-02	\$1151
	OPM-89-03	
Ballistics Pond		S1127
		\$1128
TOTAL WELLS	3	4

TABLE 9—6
CHEMICAL ANALYBE'S PERFORMED ON SURFACE WATER SAMPLES —
OLEUA PLANT AND OLEUM PLANT PONDIBALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

					INOPGANICS						OPIGANICS	_	\lceil
SAMPLE LOCATION	METALS	TAL TAL METALS AT NHANZ NZKJEL 804 CL ALK HARD VOC BNVA NG DNT	Ж	NH3N2	NZKJEL	504	ರ	AEK	HARD	Ş	BNA	2	¥
BALLISTICS POND													
BPW-01-01	1	-	-	ı	ŧ	-	-	-	•	-	-	1	I
BPW-61-02	1	-	-	1	1	-	-	_	-	-	_	;	ı
BPW-90-01	-	I	-	1	ı	-	-	-	-	1	1	ł	1
BPW-w0-02	-	ı	-	ŀ	ı	-	-	-	-	I	1	ı	1
BPW-90-03	-	I	-	ı	1	-	-	-	-	t	1	1	ī
TOTALS	•	~	10	•	•	w	w	•	10	~	~	•	•

NOTES:

BN/A = base—neutral and acid—extractable organics by GCMS

DNT = 2.4- and 2.6-dinitrotoluene by HPLC

GCMS = Gas ChromatographyMass Spectrometry

HPLC = High Performance Liquid Chromatrography

METALS = AL, CA, FE, MG, NA, PB

NAM = nitrosemines by GC

N2KJEL = Mitrogen by Kjeldahl Method

PP = Priority Poliutant Metals (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)

TAL = Toxic Analyse List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

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VOC = volatile organic compounds by GCMS

CHEMICAL ANALYSES PERFORMED ON SEDIMENT SAMPLES -OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND TABLES-6

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

								NORGANICS						H	ľ	OTHER	-		SPAC	10 B		
	L			TOTAL METALS	META	9		l	ľ		TCLP METALS	-	AMIONS	ø			-					
SAMPLE LOCATION PP	£	₹	5	ž	8	5	9	æ	8	5	1	2	NIT SO4 NHSN2	<u>고</u>		50	Ŧ	8	SWA	2	MG NAM	
OLEUM PLANT AND PC	Š													1			1					
OPS-61-01	1	1	-	-	1	1	1	1	ı	t	ı	i	-	_	ı	-	-	ļ	I	1	ł	ı
OPS-81-02	I	ı	-	-	1	1	ı	1	1	ı	1	ı	-	_	ı	-	-	I	ı	İ	1	ı
OPS-81-03	1	l	•	-	1	1	1	ı	i	ı	ł	i	-	_	ı	-	-	ı	ı	1	ı	i
OPS-81-04	ı	1	-	-	ı	1	ı	i	ı	t	ì	i	_	_	ı	-	-	ı	1	İ	1	ı
BALLISTICS POND																						
BP8-61-01	1	-	ı	1	ł	ł	1	-	ı	ı	ı	1	-	_	-	ı	ı	-	-	ı	l	1
BPS-81-02	ı	-	ł	I	ı	ı	1	-	ı	l	ı	ı	-	_	-	ı	ı	-	-	I	ł	ı
BPS-01-03	ı	-	ı	ı	ı	ı	ı	-	ı	ı	1	i	-	_	-	I	ı	-	:	1	İ	ŀ
BPS-81-04	!	-	J	1	I	ı	ı	-	1	ı	ı	ŀ	-	_	-	1	ı	-	-	ı	İ	1
BPS-01-05	1	-	1	1	1	1	1	-	1	1	ı	ı	-	_	-	ı	t	-	-	1	l	l
BPS-81-06	I	-	J	1	1	t	ı	-	ı	ı	i	ı	-	_	-	1	ı	-	-	i	ı	ı
TOTALS	•	•	•	•	0	•	0	•	0	0	0	0	10	10	•	•	4	•	•	0	•	0
																						I

NOTES:

PP = Priority Pollutent Metals (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)
TAL = Toxic Analyse List (2 'AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic con _ vunde by GC/MS

GCA48 = Gas Chromatography/Mass Spectrometry

BN/A = base-neutral and acid-extractable organics by GCMS

NAM = nitroeamines by GC

DNT = 2.4- and 2.6-dinitrotoluene by MPLC HPLC = High Performance Liquid Chromatrography

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TABLE 9-7 CHEMICAL ANALYSES PERFORMED ON SUBSURFACE SOIL SAMPLES OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

								INORGANICS	SICS						OTHER	R			OPPANICE	2	Γ
			_	METALS	oć.				TCLP	TCLP METALS		1	ANONS								
SAMPLE LOCATION	۵	¥	8	5	S E	F	ž	£	8	CB CB	15 E	E E		804 TOC		PH TPHC VOC BIVA	NOC E	¥	2	3	
OLEUM PLANT AND P																					Γ
OPB-81-01	1	ı	•	•	4	*	ł	4	ı	1	1		7	4	•	1	1	I	I	ł	I
OPB-81-02	1	ł	ĸ	40	40	1	ю	6	ı	ı	 		9	10	6	1	ı	ı	ı	i	1
OPB-81-03	ì	ł	6	10	10	ŧ	10	40	1	ı	1	,	5	10	10	I	ı	ı	1	1	١
OPB-61-04	ł	ı	8	40	40	40	1	60	1	1	1		5	40	40	1	I	ı	ı	ı	1
OPB-81-05	1	١	6	G	40	40	ı	40	1	1	' 		9	40	40	1	t	1	ı	i	1
OPB-81-06	1	1	ł	1	ı	ł	1	1	1	1	1		9	1	1	1	ı	ı	ı	ı	I
OPB-81-07	1	ı	١	١	I	1	1	1	į	1	1		8	ł	I	1	I	I	Į	ı	ı
OPB-01-08	ı	ı	I	ı	I	ı	ı	1	Į	ı	1	,	i.	1	١	I	ı	ļ	ŀ	١	I
OP8-81-09	1	ł	١	١	I	١	1	١	1	1	1			1	1	I	ı	ı	ı	ı	I
OPB-81-10	I	1	١	1	ł	ŀ	ı	ı	j	1	1		-	1	1	I	I	١	1	1	1
OPB-91-11	ı	1	ı	ı	ı	ı	1	ı	J	ı	1	·		1	I	i	ł	ı	ł	1	1
OPB-91-12	ı	ı	I	I	1	1	1	1	j	ı	1	•		l	ł	1	ı	!	ı	1	1
OPB-81-13	1	1	1	İ	I	1	ı	ŀ	ļ	ı	1	·	7	ı	ı	1	ı	1	ı	t	1
TOTALS	•	•	7	2	2	7	5	*	•	•	•	8	\$	*	2	0	•	•	•	•	•

NOTES:

PP = Priority Pollutant Metale (13) (AG. AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)

TAL = Toxic Analyte Liet (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCAMS

GCAMS = Gae Chromatography/Mass Spectrometry

BN/A = base—neutral and acid—extractable organics by GCAMS

NAM = nitrosamines by GC

DNT = 2.4—and 2.9—dinitrotoluene by HPLC

HPLC = High Performance Liquid Chromatrography

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CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES - OLEUM 1: ANT AND OLEUM PLANT POND/BALLISTICS FOND TABLES

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

								NONG	KORGANICS										•	₹ 0 ₩	2		E
					METALS	Ø				ANIONS	SNO			OTHER	es.							_	
SAMPLE LOCATION	PP TAL	7	5	CA NA CD CR	8	5	되	2	ž	Ħ	ಕ	804	4ARO	ALK.	108	200	NIT CL 804 HAPD ALK TDS TOC NHSN2 VOC BNVA	200		NG NAM DNT	3	Ę	
BALLISTICS POND																		'					
	1	1	1	I	1	1	ł	1	ł	œ	•	6	œ	œ	6	∞	ļ	80	l	1	ı	ſ	1
	1	ı	ì	ı	ı	1	1	1	ı	•	∞	©	a	∞	∞	₩	1	6	ı	1	ı	ı	1
OLEUM PLANT AND POND	_																						
	1	ł	-	-	-	-	60	∞	ı	®	æ	8	00	∞	8	I	I	6	t	ı	i	1	ı
OPM-89-02	1	I	-	-	-	-	Ø	Ø	ı	æ	æ	6	ø	ø	æ	ł	1	æ	ł	ı	ı	1	ı
	1	İ	-	-	-	-	60	•	ı	60	∞	60	80	©	60	ı	ı	0	١	1	ı	1	1
	1	١	-	-	-	-	0	0	ı	0	∞	8	80	6 0	∞	ı	!	60	I	ŧ	ı	ſ	ı
	1	1	-	-	-	-	0	00	1	0	60	80	Ø	6 0	60	1	1	80	1	1	ı	1	1

NOTES:

PP = Priority Poliutant Metale (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)
TAL = Toxic Analye Liet (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCMS
GCMS = Gas Chromatography/Mass Spectrometry
BN/A = bass-neutral and acid-extractable organics by GCMS

NAM = nitrosamines by 9C

NA = 2,4 - and 2,8-dinitrololuene by HPLC

IPLC = High Performance Liquid Chromatrography

B = Analyzed in Both Rounds (One and Two). t = Analyzed in Round One Only.

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TABLE 9-9 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
OPM-89-03	0.9	1x10 ⁻¹	Fine sand with gravel (SP) over gravel (GP)

Notes:

Hydraulic Conductivity Tests completed during March and November, 1989, and November and December 1991.

Field data and calculations are presented in Appendix I.

Values for hydraulic conductivities represent an averaged value of multiple tests performed on each well.

Water level recovery at these wells impacted by inertial effects, resulting in water level recovery above static water levels. Hydraulic conductivity measurements may be greater than the calculated values at these wells.

cm/sec = centimeters per second

TABLE 9-10 HORIZONTAL GROUNDWATER GRADIENTS OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL PAIRS	HORIZONTAL GRADIENT (#/#)1	COMMENT
Oleum Plant and Ole	eum Plant Pond	
OPM-89-02 S1132	0.0004	Southerly and easterly flow vectors in deep regional system
DBN-89-04B	0.0004	Southerly and easterly flow vector in deep regional flow system
Ballistics Pond		
S1127 S1128	0.008	Southerly flow vector in shallow flow system

Notes:

ft/ft

Gradient calculations are presented in Appendix H. All gradient calculations based on 12/13/89 water level measurements teet per foot

TABLE 9 – 11
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

		OPB-91-01	OPB-91-01	OPB-91-01	OPB-91-01	OPB-91-02	OPB-91-02	OPB-91-02	Orb-91-02	OPB-91-02	CPB-91-03
SAMPIC Type:		BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
UNITS		000	000	100	000	000	000	nge	990	990	991
DATE SAMPL	ä	10/23/91	10/23/91	10/23/91	10/53/91	10/10/01	10/10/91	10/10/91	10/10/91	10/10/61	16/10/01
oreni		2.000	9.000	16.000	21.000	2.000	7.000	12.000	22.000	62.000	2 000
Metals	ಕ್ಷ	14.400	13.000	13.500	10:000	4.860	22.900	28.200	10.200	3.150	30.300
	FE	16500.000	16300.000	11700.000	27300.000						
	HG	,	ı	,	i	0.115	•	•	1	ı	1
•	Z					4.210	16.000	12.000	13.400	9.640	23.100
-	B	6.820	10.400	8.790	45.000	4.760	18.000	13.000	20.000	2.600	16.000
Anions	LIX.	1.680	1.980	1.680	1.280	1.680	6.190			1.110	0,1.1
	804	8.500.000	14000.000	200.000	260.000	90.700	220.000	58.300	12.100	7.640	27.600
Indicator	PH	905:9	7.640	8.950	9.230	8.160	6.760	10.400	\$.600	7.980	9
parameter	TOC	9120.000	1980.000	9230.000	8680.000	\$840.000	13800.000	4660.000	975.000	3050.000	23100.000

TABLE 9–11
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/ BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

lite ID.	!	OPB-91-03	OPB-91-03	OPB-91-03	OPB-91-03	OPB-91-04	OPB-91-04	OPB-91-04	OPB-91-04	OPB-91-04	OPB-91-0
sample Type:		BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
UNITS		990	nge	000	000	OGG	000	990	990	990	000
DAIE SAMPLED:	Ë	10/10/01	10/10/91	10/10/91	10/10/91	10/10	10/10/91	10/10/91	10/10/91	10/11/01	10/10/01
DEPTH:		000.9	11.000	21.000	101.000	2.000	9.000	11.000	21.000	91.000	2.000
Metals	3	22.000	2.050	4.060	2.640	21.300	25.800	21.500	8.090	7.120	21.600
	FE					11200.000	22300.000	43600.000	8360.000	8270.000	188(N).000
	HG	,	,	1	,	•	1	•	ı	1	,
	Z	15.400	6.420	3.960	1						
	8 4	9.100	8.200	2.590	2.260	15.000	14.000	12.000	2.690	15.000	18.000
Anions	LIX	,	1.380	1.430	3.50	1.230	3.	1.960	1.320	1.910	
	\$0 4	230.000	89.700	380.000	ı	39.900	17.600	11.100	•	15.900	110
Indicator	H	7.800	8.200	8.060	12.800	0.8.5	7.060	7.820	13.100	9.720	98
Barameter	TOC	2960,000	2170.000	1500.000	0000016	11900,000	4840.000	6340.000	6360,000	3930,000	11740 000

Þ

TABLE 9- 11
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/BALLISTICS PUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Type: UNITS: DATE SAMP! ED:	: ED:	OPB-91-05 BORE UGG 10/10/91 7,000	OPB-91-05 BORE UGG 10/10/91 12.000	OPB-91-05 BORE UGG 10/10/91 22.000	OPB-91-05 BORE UGG 10/11/91	OPB-91-06 BORE UGG 10/23/91 2.000	OPB-91-06 BORE UGG 10/23/91 7,000	OPB-91-06 BORE UGG 10/23/91 12.000	OPB-91-07 BORE UGG 1023/91 2.000	OFB-91-07 BORE UGG 1023/91 7,000	OPB - 91 - 07 BORE UGG 10/23/91
Metals	2 H 2 Z	26.300 34100.000	9.130	6.450 7350.000	4.970 \$770.000		•				
Anions	SO PER SO	15.000	13.000	13.000	1.180	2.140	1.340	1.980	3.460	085:1	2.120
Indicator	7. TOC	1.350	9.290	9.670	9.240						i :

TABLE 9–11 SUMMARY OF SUBSURFACE SOII. CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Site ID:	OPB-91-08	OPB-91-08	OPB-91-08	OPB-91-09	OPB-91-09	OPB-91-09	OPB-91-10	OPB-91-10	OPB-91-11	OFB-91-1
Sample Type:	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
CINITS	000	000	000	nge	nge	990	990	000	990	990
DATE SAMPLED:	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91
EPTIL	2,000	7.000	11.000	2.000	000'9	12.000	2.000	7,000	2,000	0000
丑										
HG										
Z										
TIN seoin										
\$05	1800.000	79.000	110.000	1	33.900	6.520	1	-	1	24.900
parameter TOC							ļ			

TABLE 9-11
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/ BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE BORE	Site ID:		OPB-91-11	OPB-91-12	OPB-91-12	OPB-91-12	OPB-91-13	OPB-91-13
UGG UGG UGG UGG UGG UGG UGG UGG UGG UGG	Sample Type:		BORE	BORE	BORE	BORE	BORE	BORE
CR FE HG NIT 190.000 1000.000 1400.000 3400.000 PH TOC	UNITS		000	000	990	990	000	990
CR FE HG NI NIT SO4 190.000 1000.000 1400.000 3400.000 PH TOC	DATE SAMPLED:		10/23/91	10/23/91	10/23/91	10/23/91	10/23/91	10/23/91
CR FE HG NI NIT SO4 190.000 1000.000 1400.000	DEPTH		11.000	2.000	90009	11.000	2,000	0000
FE HG NI NI PB SO4 190.000 1000.000 1400.000 PH TOC		CR						
HG NI PB NIT SO4 190.000 1000.000 1400.000 PH TOC		品						
NI PB NIT SO4 190.000 1000.000 1400.000 PH TOC		HG						
PB NIT 190.000 1000.000 1400.000 PII TOC		Z						
NIT SO4 190,000 1000,000 1400,000 PH TOC		82						
SO4 190,000 1000,000 1400,000 PH TOC		LIN						
PH TOC		\$0 1	190.000	1000.000	1400.000	3400.000	1	310.000
		E						
		TOC						

TABLE 9-11 SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLEUM PLANT POND/ BALLISTICS POND REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
	H		M		×	H	H		#	w	H	н	*	н
Ξ	2	ngr	VOC	SVOC	Blank cell	•	5	6	9	۵.	~	s	_	×

Appendix K contains complete analytical results
USATILAMA chemical codes are defined in the RI Glossary Report

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TABLE 9–12
SUMMARY OF SEDIMENT CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		BPS-91-01	BPS-91-02	BPS-91-03	BPS-91-04	BPS-91-05	BPS-91-06	OPS-91-01	OPS-91-02	OPS-91-03	OPS-91-04
Sample Type:		POND	POND	POND	POND	POND	POND	POND	POND	POND	FOND
SLING	•	990	000	nee	990	ngg	990	990	990	nge	000
DATE SAMPLED:	PLED:	10/07/91	10/07/01	10/02/91	10/02/91	10/05/91	10/02/91	10/03/91	10/03/91	10/03/91	16/03/91
DEPTH		0.000	0.000	0.000	0.000	0.000	0.000	0000	0000	0000	0.000
SVOCe	ВЗЕНР	•	1.270	1	6.100	1					
	PHANTR	ı		1	0.428	1	ı				
Metals	AL	17200.000	20500.000	22300.000	\$8000.000	10200.000	19700.000				1
	ડ							36900.000	4380.000	4700.000	4730.000
	۲ ۲							120.000	ı	67.200	70.00
	PB	33.000	8.800	19.000	24.000	2.070	3.240				
Anions	HZ	5.160	-	*	•		•	15.500	14.000	45.000	SO O.
	204	62.700	114.000	63.900	490.000	76.400	77.700	\$90.000	300.000	160.000	230 000
Indicator	CHN3	13.900	215.000	23.800	71.200	17.700	-				!
parameter	F							13.200	8.200	11.800	7.540
	TOC							23400.000	32300.000	37400.000	25400.000

TABLE 9-12 Stjmmary of Sediment Chemical DataOleum Plant and Oleum Plant Pond/ Ballistics Pond Remedial Investigation Badger Army Ammunition Plant

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
		u	H			*	u	*	×	u	19		#	
Ξ	(2)	700	700 200	SVOCs	Blank cell	•	GT	2	9	۵.	~	S	1	×

USA'I'HAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results

TABLE 9–13
SUMMARY OF SURFACE WATER CHEMICAL DATA—
OLEUM PLANT AND OLEUM PI ANT POND/BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		BPW-90-01	BPW-90-02	RPW-00-03	BPW_01_01	of the man
Sample Type:		CNO	UNOM	CNO	io io di	70-16-W 10
UNITS		ner	151	201	25.	ONO.
DATE SAMPLE	Ė	90,500	7000	200	3	3
DATE SAMPLED.	ä	06/17/60	09/27/90	09/21/90	10/02/91	10/02/91
DELIN		1:0	7.0	12.0	0.000	0000
Metals	I	756.00	00.00	00 0901	000	
	1	999	00000	1000.00	180.000	123.000
	¥g ;				36.700	34.600
	ర	6190.00	6280.00	6730.00	6510.000	6260,000
	표	879.00	1040.00	1380.00	315.000	217.000
	×				1490 000	1940 000
_	MG	3030.00	3110.00	3160 00	2020 000	00000
	22				000000	2010:000
					79.000	76.800
	₹ Z	3600.00	3540.00	3550.00	3780.000	3580.000
	>				5.230	ı
	ZN				67.900	35.400
Anions	ರ	2980.00	2930.00	3380.00	3750.000	4050.000
	H	,	11.223	1	\$1.400	43.100
	\$Q\$	12000.00	12000.00	8520.00	14000.000	15000.000
Indicator	ALK	16000	18000	21000	21100	21100
parameter	HARD	27000	27600	28900	29100	20100
	pH(1)	8.6	9.0	0.6	7.3	7.8
	Sp.Cond.(2)	92	89	75	206	200
						,

TABLE 9-13 SUMMARY OF SURFACE WATER CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/ BALLISTICS POND REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
H	*	*	H	N		H		Ħ	*	H		*	H	
ε	3	ner	VOC	SVOC	Blank cell		GT	6	Ö	۵.	~	20	<u>-</u>	×

USATHAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results

TABLE 9–14
SUMMARY OF GROUNDWATER CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Tone:		OPM.	OPM-89-01	MO	M-89-02	OPM	-89-03	S	1127	S	1128
UNITS		. D	<u> </u>	_	WELL	∌ ⊃	WELL	≩ =	WELL	3 -	WELL
DATE SAMPLED: ROUND:	PLED:	12/05/91 ONE	04/09/92 TWO	11/24/91 ONE	04/08/92 TWO	12/06/91 ONE	04/08/92 TWO	12/03/91 ONF	04/13/92 TWO	12/04/91 ONE	04/13/92
VOC	CH2CL2	4.510 P	6.270 B	4.310 P	4.900 P	2.940 P	4410 P	2 88 7	8 090	2.30	2 2
Metals	5	100000	100000	\$2000	480000	00000	00089	8	a otori	600	0.270 B
	%	8.17	ı	65.5	1	797	1				
	۲ Z	1	120000	1	16000		11000				
Anions	LIN	089	065	1400	620	9860	810	280	007	290	Q.
	5	10000	130000	2600 P	2400 P	0016	0056	3600	4800	3700	2400
	\$0 1	200000	170000	28000	28000	76000	74000	12000	15000	15000	00071
Indicator	VLK	304000	254000	200000	174000	218000	210000	118000	82000	00076	00076
parameter	HARD	0000st	476000	234000	228000	254000	396000	128000	00096	124000	10400
	SQL	908000	701000	264000	255000	356000	339000	159000	81000	151000	00056
	201							2800	1500	1	1600
	pH(1)		7.5	9.9	7.7	7.6	7.8	8.2	8.0	•	8
	Sp.Cond.(2)		972	466	385	15+	575	242	2	226	706

TABLE 9- 14
SUMMARY OF GROUNDWATER CHEMICAL DATAOLEUM PLANT AND OLEUM PLANT POND/ BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		S	132	S	1151
Sample Type:		WE	WELL	≯ ~	WELL UGL
DATE SAMPLED:		12/05/91	04/09/92	11/24/91	04/08/92
ROUND:		ONE	TWO	ONE	0#1
VOCs	CH2CL2	4.710 P	4.220 P	4.120 P	1
Metals	CA	\$8000	00095	00059	70000
	%	6.31	ı	7.27	•
	₹ Z	3130. T	11000	ı	7700
Anions	LIN	995	95.	1200	1500
	C	2500 X	2700 P	1910	2070
	804	34000	32000	33000	3,5000
Indicator	ALK	192000	346000	263000	274000
	HARD	238000	252000	290000	296000
	TDS	269000	268000	304000	324000
	pH(1)	8.0	0.9	9.9	7.6
	Sp.Cond.(2)	442	425	895	491

TABLE 9-14 SUMMARY OF GROUNDWATER CHEMICAL DATAOLEUM POND AND OLEUM PLANT POND/ BALLISTICS POND REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

= unitless	 Specific conductivity, umhos/cm 	 Micrograms per liter (parts per billion) 	- Volatile organic compounds	 Semi-volatile organic compounds 	- No analysis performed	Less than the Certified Reporting Limit (CRL)	E Greater than the reported value	= Analyte found in blank as well as sample	 Reported results affected by interferences or high background 	 Results less than CRL, but greater than Criteria of Detection 	= Analyte required for reporting purposes, but not currently certified	Results based on internal standard	■ Uncertified analyte in a certified method	* Analyte recovery outside of certified range, but within acceptable limits
ε	3	UGL	VOC	SVOC	Blank cell		5	8	Ö	۵.	~	s	i i	×

Appendix K contains complete analytical results
USATHAMA chemical codes are defined in the RI Report Glossary

TABLE 9-15 COMPOUNDS OF POTENTIAL CONCERN OLEUM PLANT AND OLEUM PLANT POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		EXPOSURE POINT CONCENTRATION	
COMPOUNDS OF POTENTIAL CONCERN	Surface Soil (µg/g)	Subsurface soil ² (\(\nu g/g\))	SEDIMENT ³ (\(\nu g/g\)
CR	14.4	30.3	
HG		0.115	
NI		23.1	
NIT	3.46	6.19	50
SO4	8,500	14,000	590

Notes:

-- = Not identified as a compound of potential concern Exposure point concentration is the maximum detected concentration

 μ g/g = microgram per kilogram; equivalent to parts per million (ppm)

Assessment of surface soil contamination (0 to 2 feet) was performed using samples from borings OPB-91-01 and OPB-91-06 through OPB-91-

Assessment of subsurface soil contamination (2 to 12 feet) was performed using samples from borings OPB-91-01 through OPB-91-05.

Assessment of sediment contamination was performed using samples OPS-91-01 through OPS-91-04.

TABLE 9-16 SUMMARY OF RISK ESTIMATES **OLEUM PLANT AND OLEUM PLANT POND**

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Current and Future Grounds Maintenance Worker	Soil Ingestion	NA	0.000003
	Inhalation of Particulates and Vapors	<u>NA</u>	<u>ND</u>
	Total Grounds Maintenance Worker	NA _	0.000003
Future Residential	Soil Ingestion	NA .	0.0005
Future Construction Worker	Soil Ingestion	ND	0.02
	Inhalation of Particulates	4×10 ⁻⁸	0.0002
	Total for Construction Worker	4x10 ⁻⁸	0.02
Future Child Playing	Ingestion of Sediment	NA	0.04

Notes:

ND not determined - toxicity factors not available for compounds of potential concern NA

TABLE 9-17 COMPOUNDS OF POTENTIAL CONCERN BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	EXPOSURE POINT	CONCENTRATION
COMPOUNDS OF POTENTIAL CONCERN	SEDIMENT ¹ (µg/g)	Surface Water ² (mg/£)
AL	58,000	0.18
B2EHP	6.1	••
ВА		0.0367
CL		4.05
MN	•••	0.0791
NH3	215	••
NIT	5.16	0.0514
PB	54	
PHANTR	0.428	
SO4	490	15
V	•••	0.00523
ZN	-	0.0679

Notes:

-- = Not identified as a compound of potential concern Exposure point concentration is the maximum detected concentration

 $\mu g/g$ = micrograms per gram; equivalent to parts per million (ppm)

mg/£ = milligrams per liter

Assessment of sediment contamination was performed using samples BPS-91-01 through BPS-91-06.

Assessment of surface water contamination was performed using samples BPW-91-01 and BPW-91-02.

TABLE 9-18 SUMMARY OF RISK FISHMATES BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Future Child Playing	Ingestion of Sediment	5x10 ⁻⁹	0.0001
	Ingestion of Surface Water	NA	0.00007
	Dermal Contact with Surface Water	<u>NA</u>	0.00007
	Total for Child Playing	5x10 ⁻⁹	0.0002

Notes:

NΔ

not applicable - no carcinogenic compounds of potential concern

TABLE 9-19 COMPARISON OF GROUNDWATER TO STANDARDS - UNITS: $\mu g/\ell$ OLEUM PLANT AND OLEUM PLANT POND/BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUNDS	FREQUENCY	MAXIMUM	MINIMUM	SDWA (1)	(3)	WI GRON	WI GROUNDWATER STANDARDS (2)	CALCULATED
OF POTENTIAL CONCERN	OF DETECTION	DETECTED CONCENTRATION	DETECTED CONCENTRATION	MCL	MCLG	ES	PAL	CONCENTRATION (3)
ಠ	14:14	130,000	1,910	250,000(a)		•	•	•
C.	5:10	8.17	5.59	001	100	(2)0S	2(c)	
Y V	6:10	120,000	3,130	20,000(b)			,	•
FIN	14:14	1,500	290	10,000	10,000	10,000	2,000	•
804	14:14	200,000	1,200	250,000(a)	•	250,000(d)	125,000(d)	٠
(1) U.S. Environ Drinking WA 1991, "Fac Water, Was Secondary Inorganic (U.S. Environmental Frotection Agency (EPA), 19 Drinking Water Standards." Office of Water, Wa 1991, "Fact Sheet: National Secondary Drink Water, Washington, D.C., September 1991; and Secondary Drinking Water Regulations; Syr Inorganic Chemicals, Final Rule," 57FR31776, for details).	Agency (EPA), 1991, "Fac fice of Water, Washingto Secondary Drinking Wi smber 1991; and EPA, 1 Regulations; Synthetic le," 57FR31776, July 17,	U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards." Office of Water, Washington, D.C., August 1991; EPA, 1991, "Fact Sheet: National Secondary Drinking Water Standards." Office of Water, Washington, D.C., September 1991; and EPA, 1990, "National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule." 57FR31776, July 17, 1992 (see Subsection 3.6 for details).		Secondary drinking water s Reporting level. Monitoring protect individuals on restri WI proposing change to ES Value for protection of publi protection of public health.	Secondary drinking water standard, suggested level. Reporting level. Monitoring is required and data is reported typotect individuals on restricted sodium diet. Will proposing change to ES = 100 µg/t and PAL = 10 µg/t Value for protection of public welfare (usually aesthetic conceprotection of public health.	suggested level. red and data is repo lium diet. rg/g and PAL = 10 e (usually aesthetic	Secondary drinking water standard, suggested level. Reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet. Will proposing change to ES = 100 \(\mu g\)/2 and PAL = 10 \(\mu g\)/2 (Sule for protection of public welfare (usually aesthetic concerns) rather than for protection of public health.
(2) Wisconsin (2) for details).	Wisconsin Administrative Code, Chapter NR 14 for details).	e, Chapter NR 140.10, T.	i0.10, Table 1 (see Subsection 3.6	3.6 SDWA MCL MCLG		micrograms per mer Safe Drinking Water Act Maximum Contaminant Level Maximum Contaminant Level Goal	evel Goaf	
(3) Calculated	Calculated to be protective at risk of 10.6 or		HI of 1 (see Subsection 4.5 for		» Wisa	Wisconsin		
details).				PAL	_	Preventive Action Limit		
				Ħ	Tres Con	Treatment technique requirement in effect Copper action level = 1,300 µg/8; Lead action level = 15 µg/8	ifrement in effect 100 µg/t; Lead actio	n level = 15 µg/8

WD039213T.9/16

TABLE 9-20 ECOLOGICAL CONTAMINANTS OF CONCERN^A OLEUM PLANT AND OLEUM PLANT POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION ⁸
Surface Soil ^C	•	
NIT	3:3	3.46
SO4	3:9	8,500
<u>Sediment</u> ^D		
NIT	4:4	o
SO4	4:4	590

Notes:

- Constituents selected based on criteria presented in Tables Q-21 and Q-22 and discussed in Section 5.0.
- 95th percentile or maximum; units in µg/g.
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples from borings OPB-91-01 and OPB-91-06 through OPB-91-13.
- Assessment of sediment contamination was performed using samples OPS-91-01 through OPS-91-04.

TABLE 9-21
ECOLOGICAL CONTAMINANTS OF CONCERN^A BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATIONS
Surface Water ^C		
AL	2:2	180
BA	2:2	36.7
CL	5:5	4,050
FE	2:2	315
MN	2:2	79.1
NIT	3:5	51.4
SO4	5:5	15,000
V	1:2	5.23
ZN	2:2	67.9
Sediment ^D		
AL	6:6	58,000
B2EHP	2:6	6.1
NH3	5:6	215
NIT	1:6	5.16
РВ	6:6	54
PHANTR	1:6	0.428
SO4	6:6	490

Notes:

- Constituents selected based on criteria presented in Tables Q-23 and Q-24 and discussed in Section 5.0.
- 95th percentile or maximum; units in $\mu g/\ell$ (surface water) and $\mu g/g$ (sediment).
- Assessment of surface water contamination was performed using samples BPW-91-01 and BPW-91-02.
- Assessment of sediment contamination was performed using samples BPS-91-01 through BPS-91-06.

TABLE 9-22 RISK EVALUATION FOR AQUATIC RECEPTORS OLEUM PLANT POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	EXPOSURE POINT CONCENTRATION®	RTV⁵	HAZARD QUOTIENT
Sediment			
NIT	50	545	0.09
SO4	590	_NA	

Notes:

- Analytical results presented in Tables Q-21 and Q-22.
- Reference Toxicity Value (RTV) derived from available quality criteria and effects threshold levels as presented in Table O-3.
- Calculated by dividing the exposure point concentration by the RTV; values in excess of 1.0E+00 indicate that the protective RTV was exceeded by environmental concentrations.

NA = none available.

TABLE 9-23 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL RECEPTORS OLEUM PLANT

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	Hazai	RD INDICES
RECEPTOR	ACUTE RISK ^b	CHRONIC RISK ^e
Short-tailed shrew	1.2E+00	1.2E+01
Eastern meadowlark	7.6E-02	7.0E-01
Garter snake	5.6E-02	5.2E-01
Red fox	2.2E-02	4.0E-03
Red-tailed hawk	6.0E-02	5.6E-03

Notes:

- Sum of the individual Hazard Quotients for each surface soil contaminant of concern; each HQ calculated by dividing the estimated exposure dose by the Reference Toxicity Value (RTV). Hazard Quotients are presented in Appendix R. Tables R-57 and R-58 for acute and chronic exposur respectively.
- b Based on comparison to acute RTVs.
- ^c Based on comparison to chronic RTVs.

TABLE 9-24 · RISK EVALUATION FOR AQUATIC RECEPTORS BALLISTICS POND

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	EXPOSURE POINT CONCENTRATION	RTV°	HAZARD QUOTIENT
Surface Water			
AL	180	748	0.24
BA	36.7	1,360	0.027
CL	4,050	230,000	0.043
FE	315	1,000	.315
MN	79.1	100	0.79
NIT	51.4	5,000	0.01
SO4	15,000	1,060,000	0.014
V	5.23	200	0.026
ZN	67.9	49.59	1.4
Sediment			
AL	58,000	NA	
B2EHP	6.1	NA	
NH3	215	75	2.9
NIT	5.16	545	0.0095
РВ	54	50	1.1
PHANTR	0.428	1,390	0.00031
SO4	490	NA	

lotes:

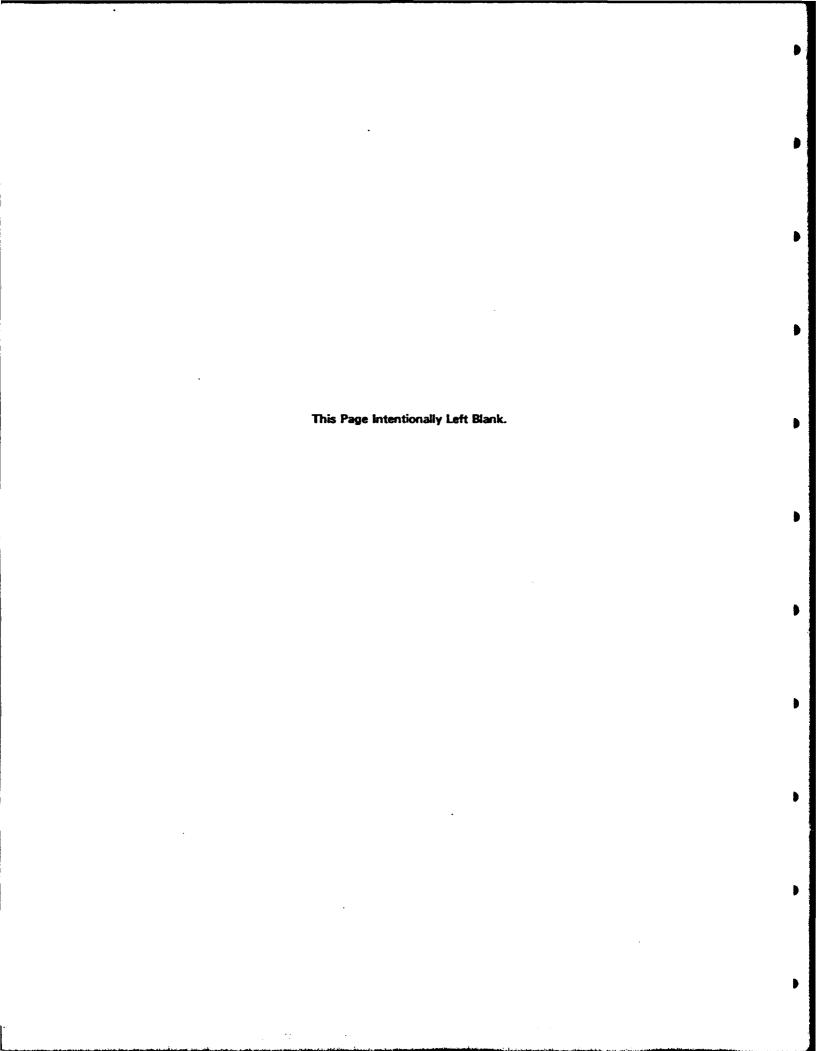
Analytical results presented in Tables Q-23 and Q-24.

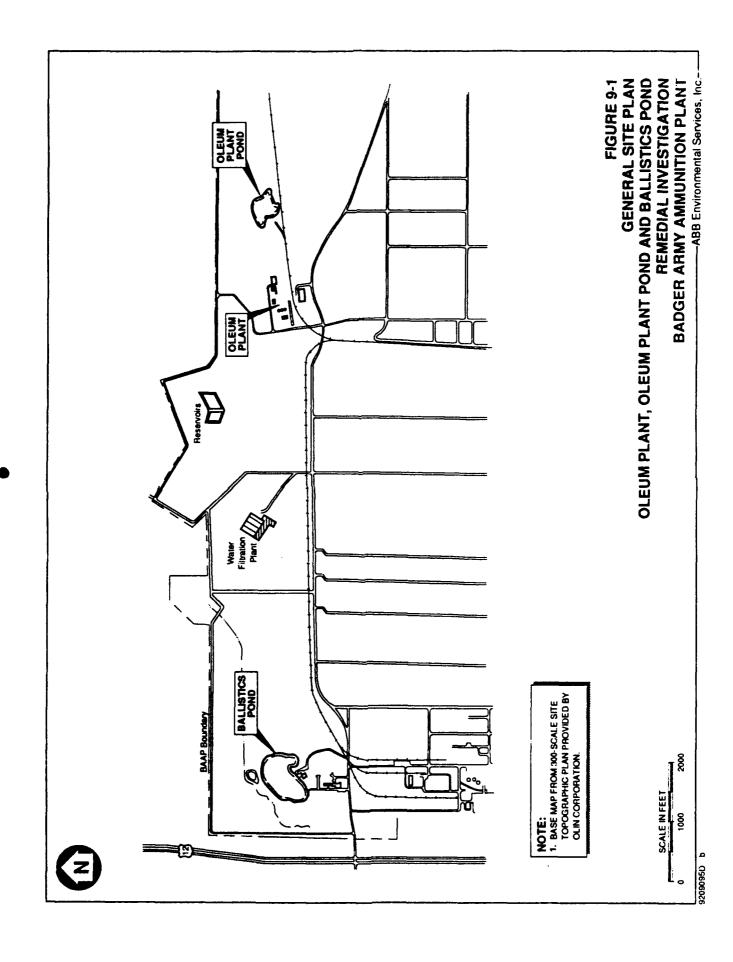
Reference Toxicity Value (RTV) derived from available quality criteria and effects threshold levels as presented in Table Q-3.

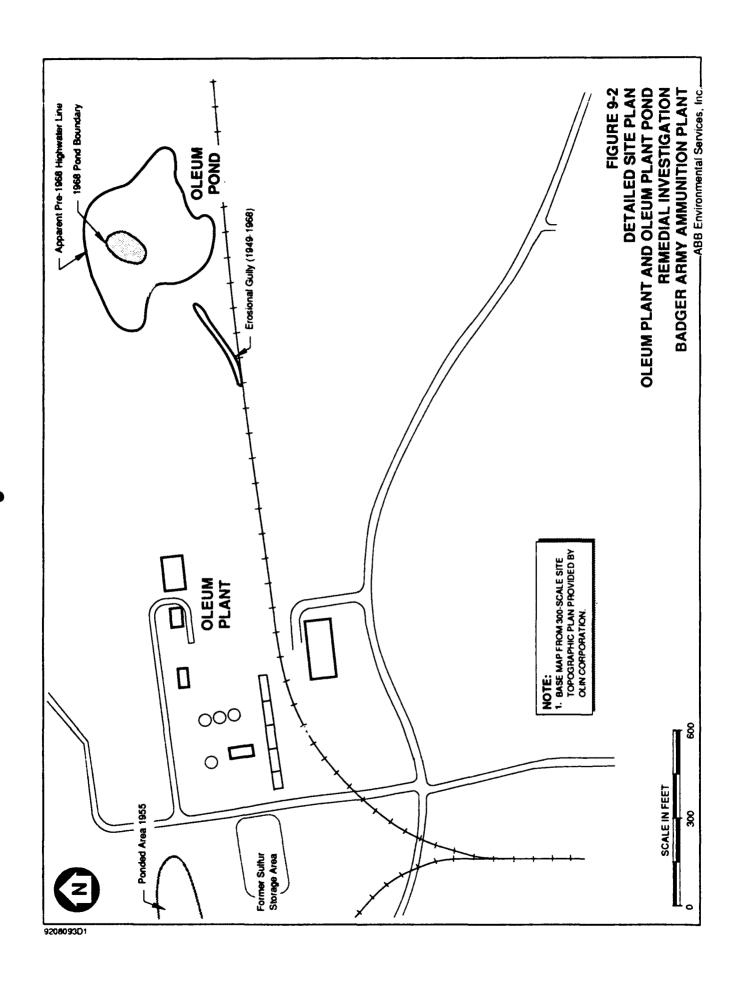
Calculated by dividing the exposure point concentration by the RTV; values in excess of 1.0E+00 indicate that the protective RTV was exceeded by environmental concentrations.

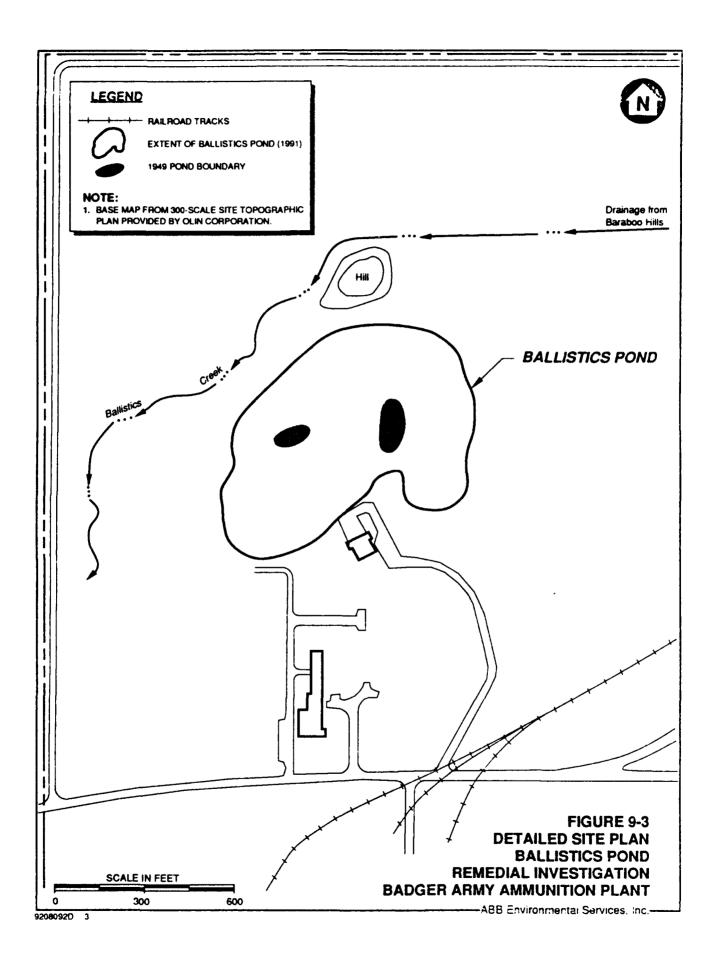
A = none available.

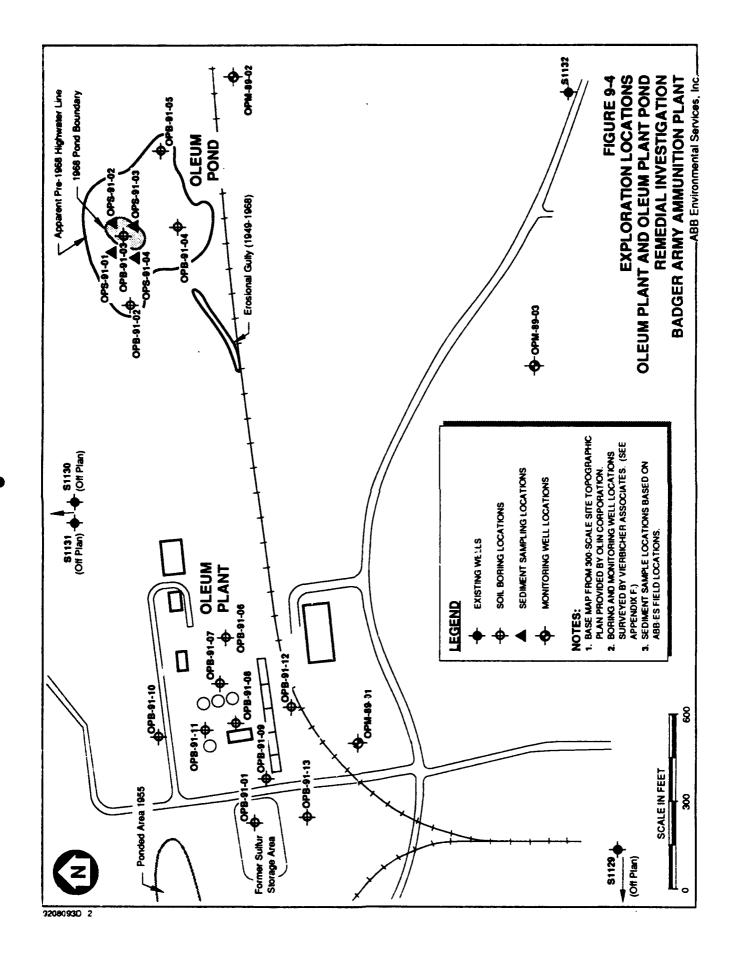
W0039213T.9/11

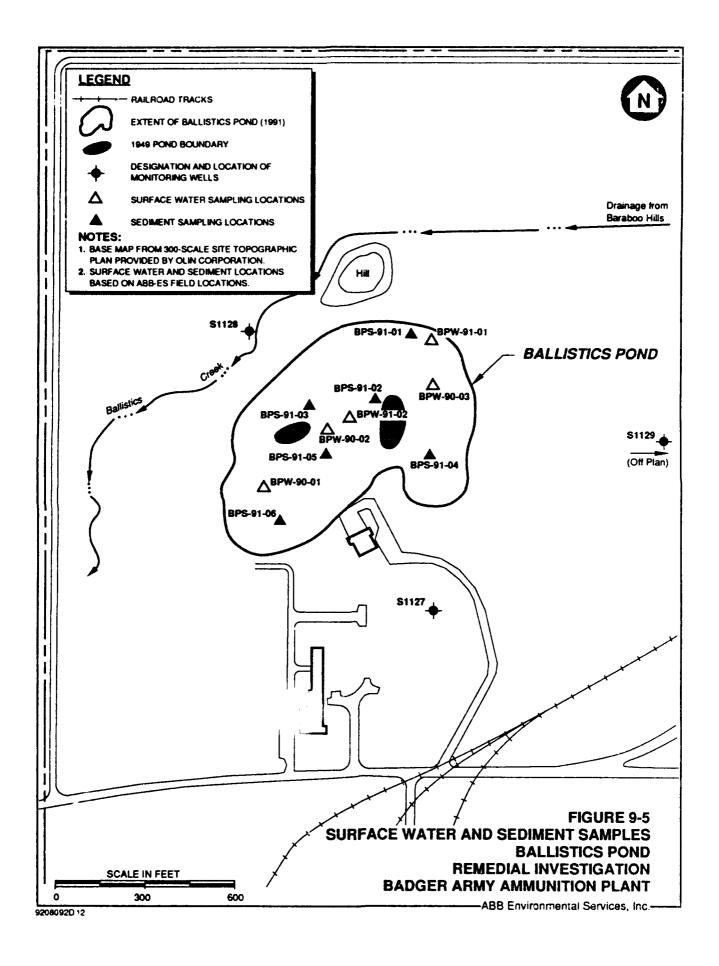


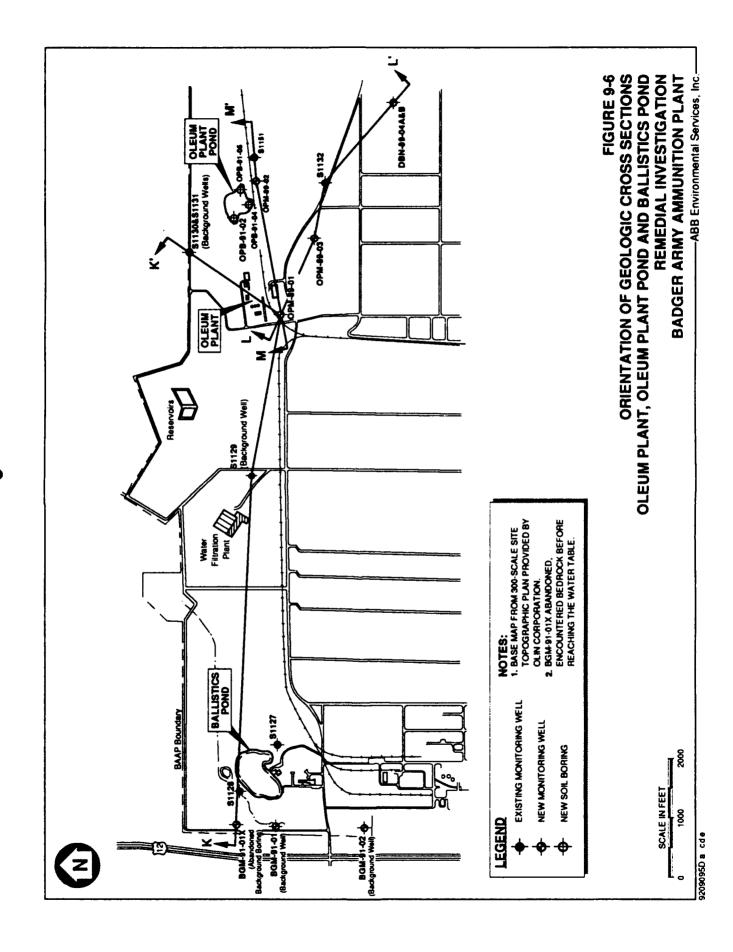


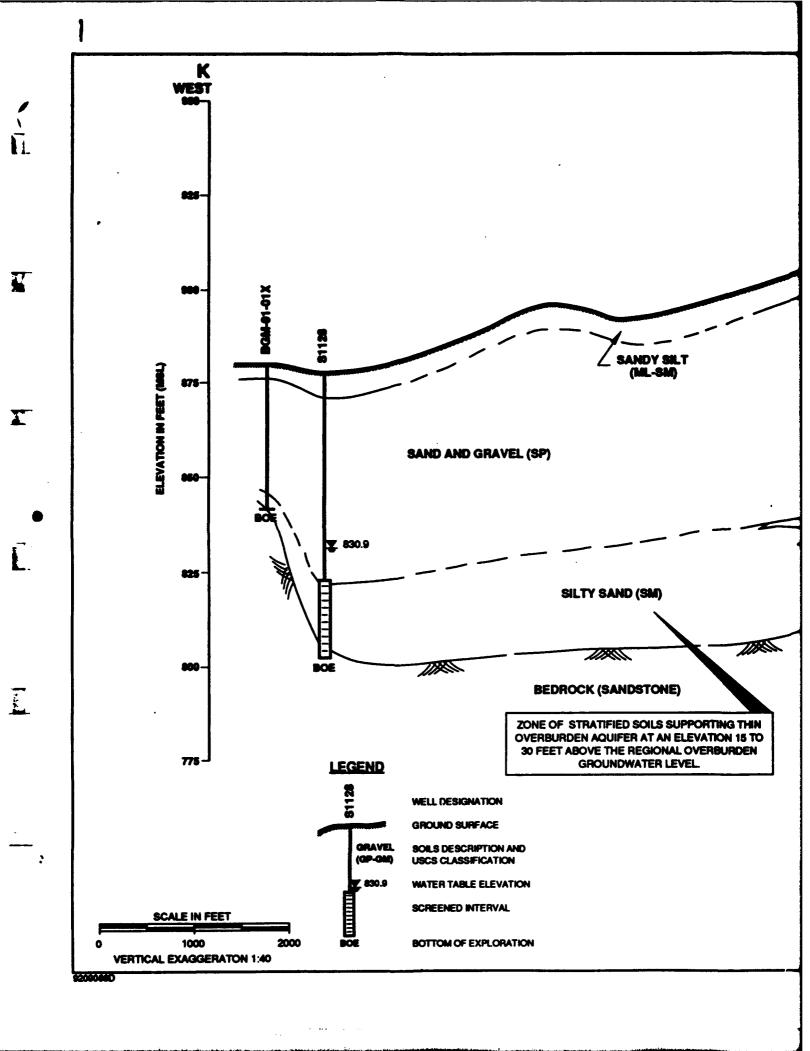


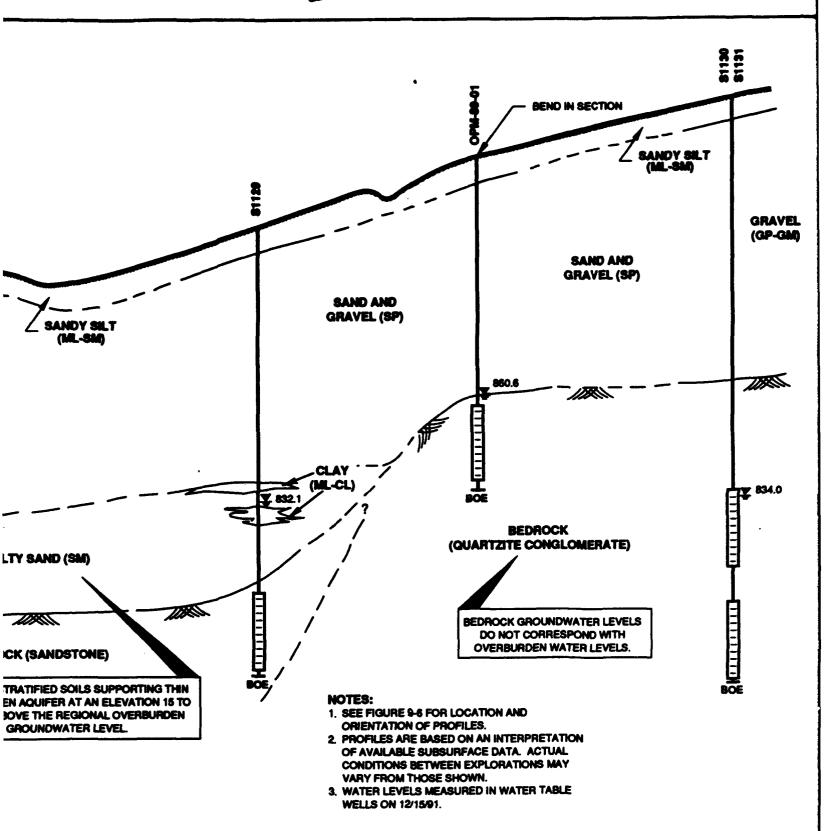






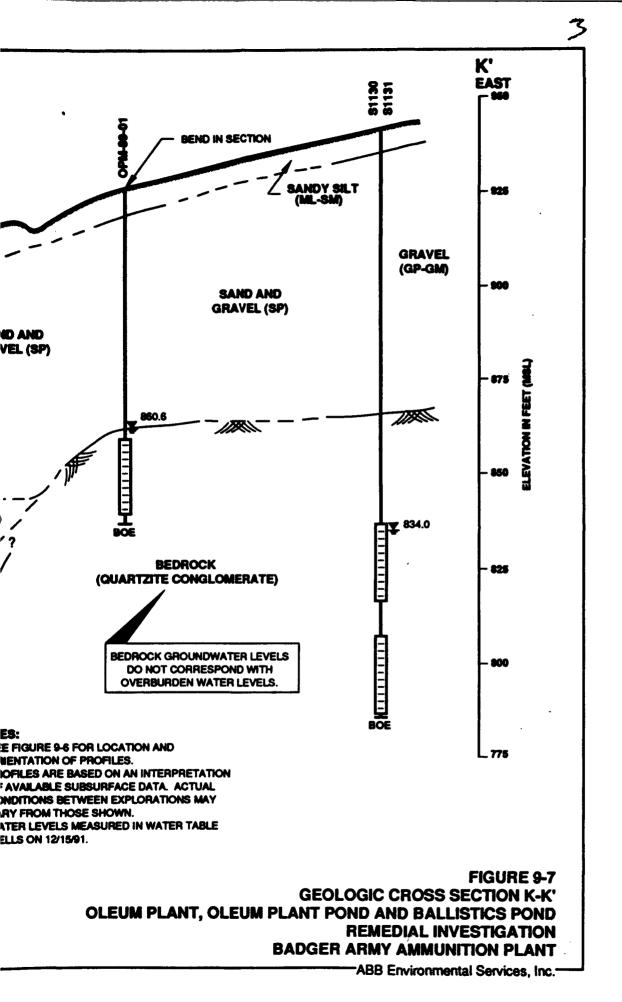


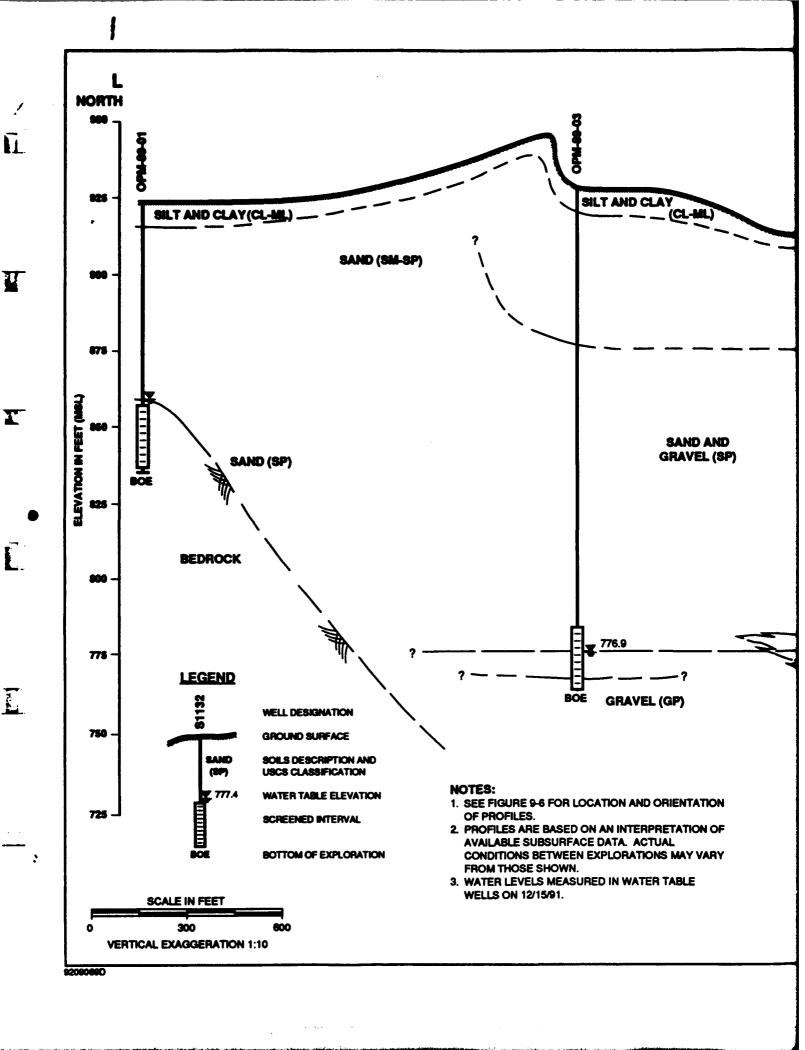


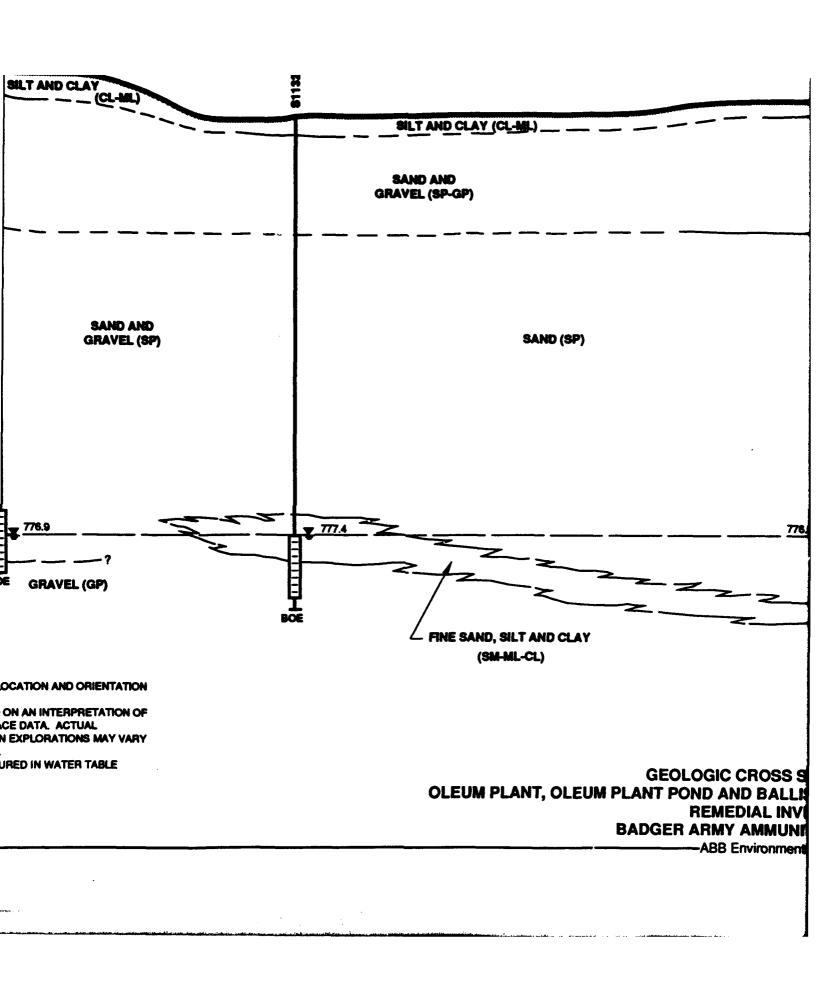


GEOLOGIC CROSS SE OLEUM PLANT, OLEUM PLANT POND AND BALLE REMEDIAL INVE BADGER ARMY AMMUNI

ABB Environment







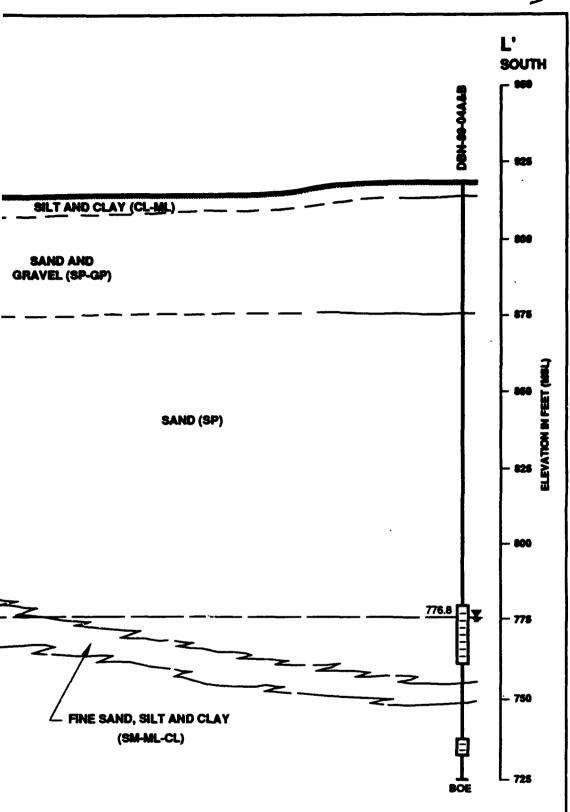
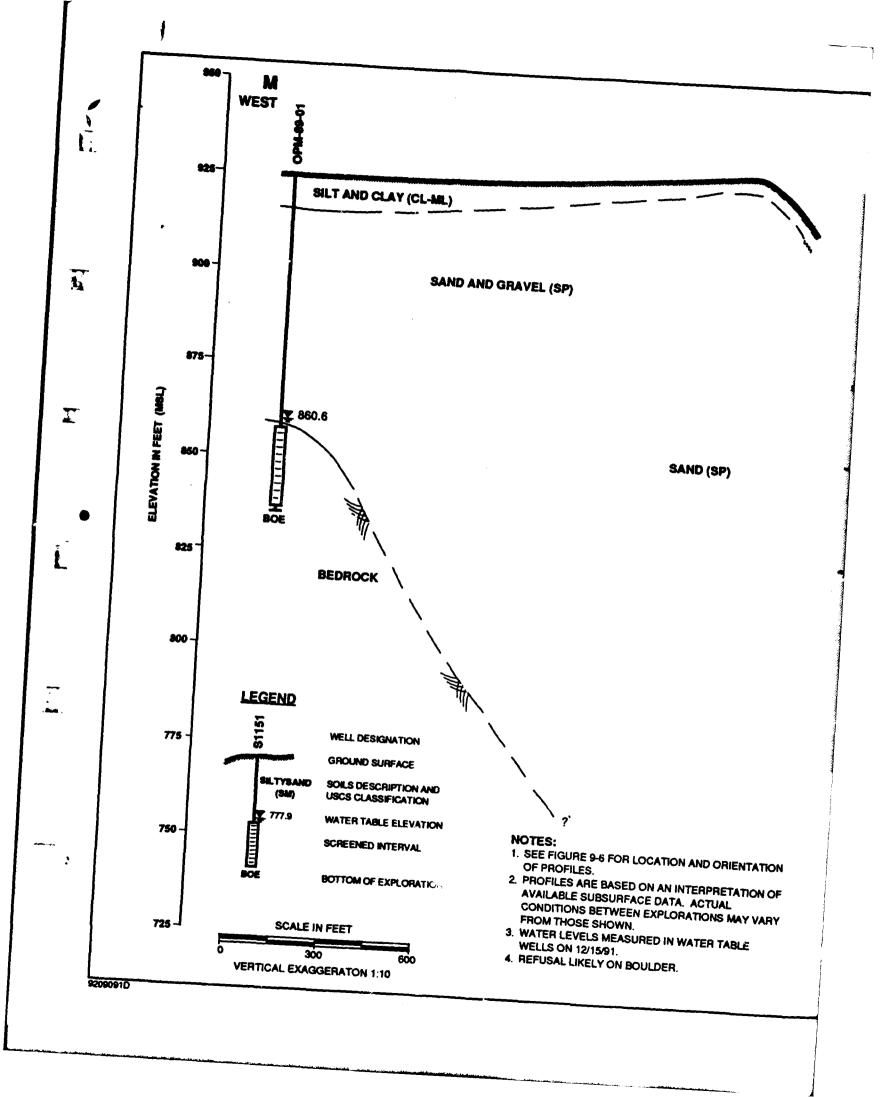
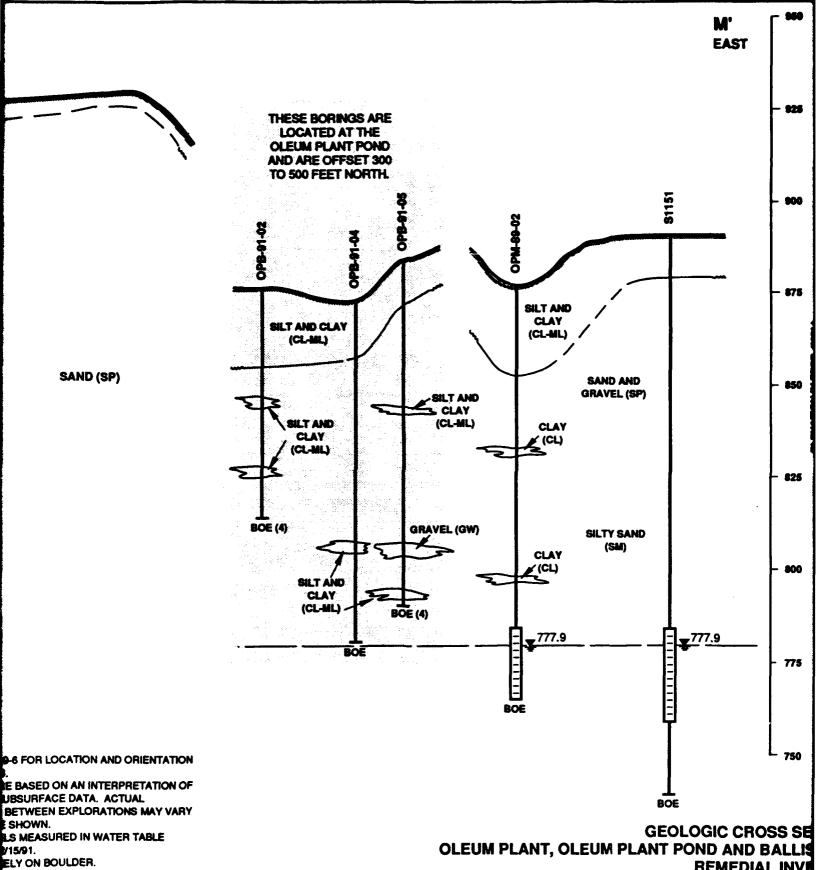


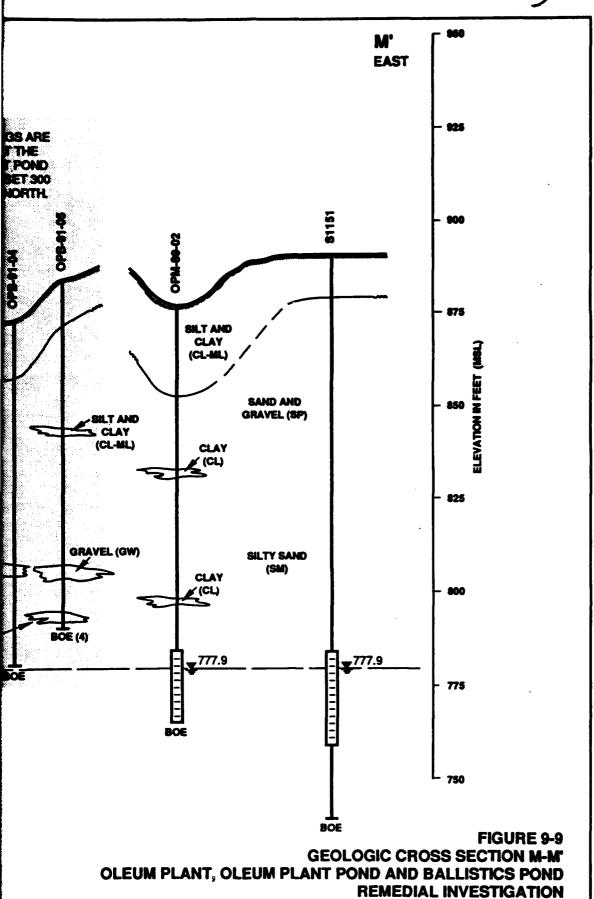
FIGURE 9-8
GEOLOGIC CROSS SECTION L-L'
OLEUM PLANT, OLEUM PLANT POND AND BALLISTICS POND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.—





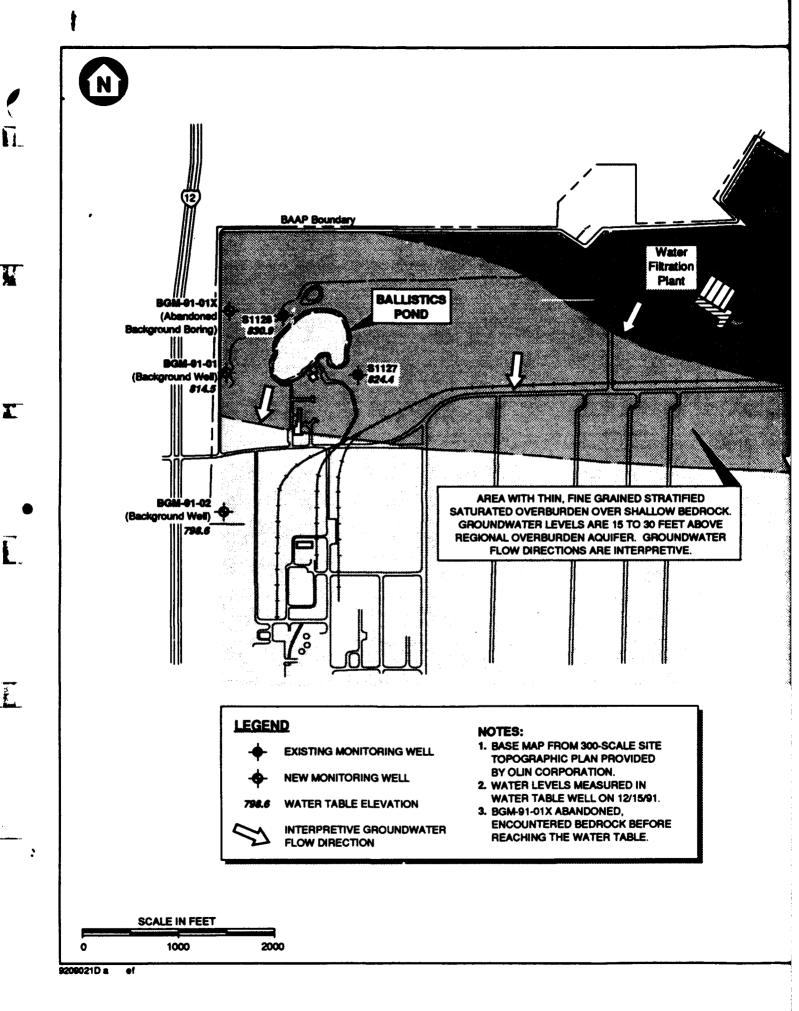
REMEDIAL INV **BADGER ARMY AMMUNIT**

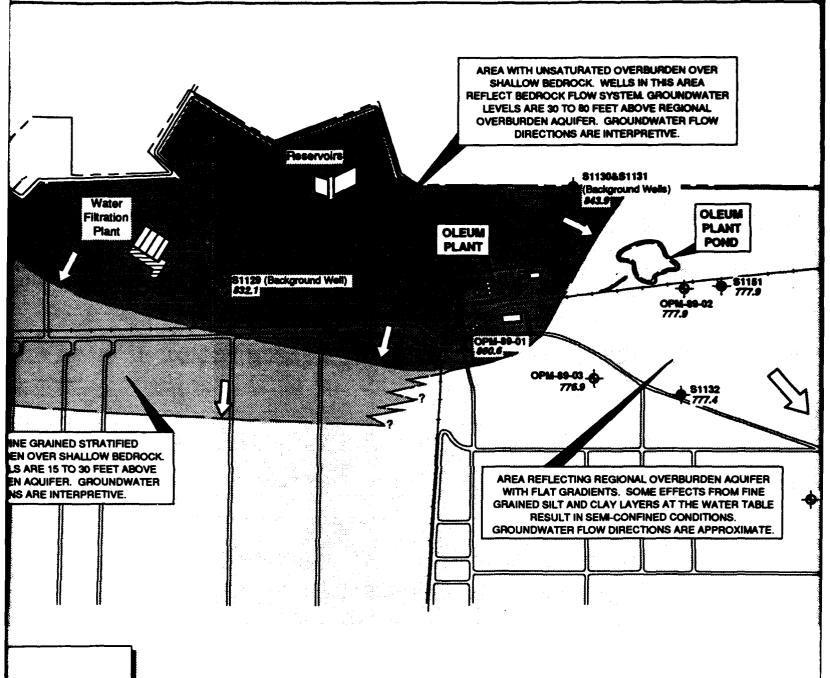
ABB Environment



REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.

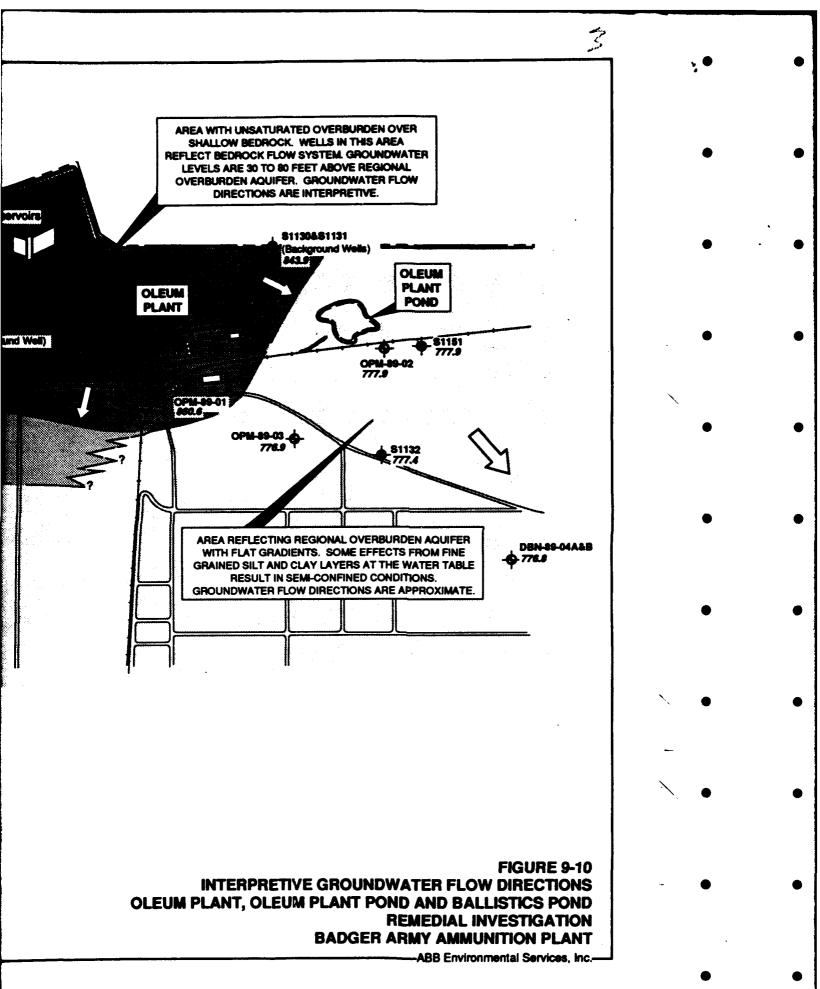


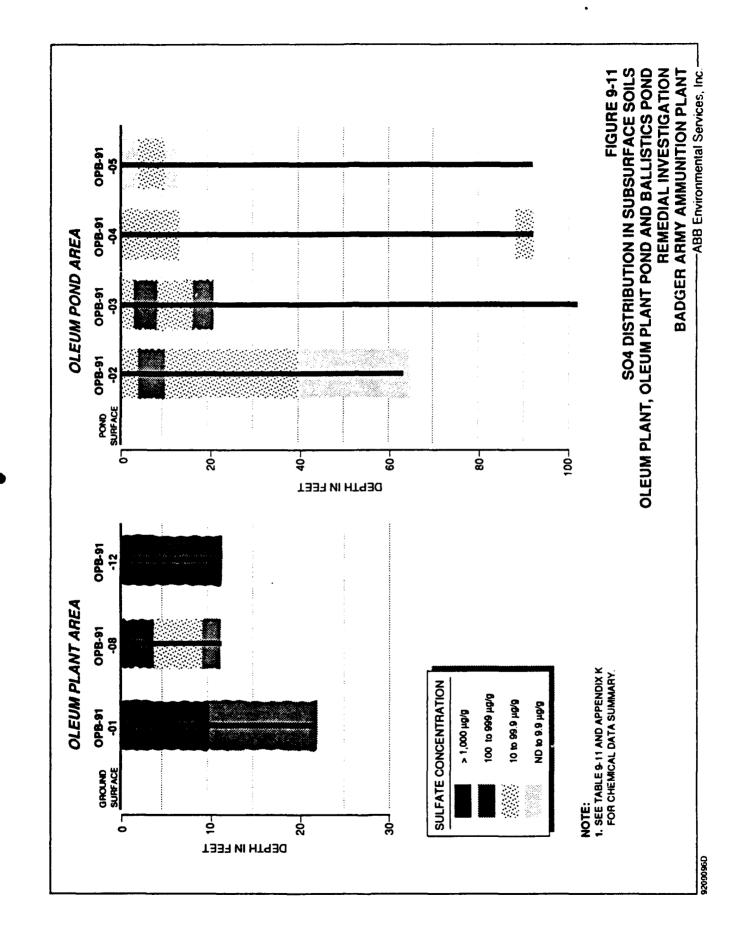


A 300-SCALE SITE
PLAN PROVIDED
RATION.
MEASURED IN
VELL ON 12/15/91.
NDONED,
BEDROCK BEFORE
WATER TABLE.

INTERPRETIVE GROUNDWATER FLOW DIR
OLEUM PLANT, OLEUM PLANT POND AND BALLISTI
REMEDIAL INVES
BADGER ARMY AMMUNITIC

--ABB Environmental





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TABLE 10-1 HISTORY OF ACID AND FUEL OIL SPILLS OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SPILL DATE	CAUSE	MATERIAL	AMOUNT	CONTROL
1970-72	Tank leakage	Acid	25 tons	Unknown
10/82	Tank leakage	Sulfuric acid	6.5 tons	Diked, neutralized
5/91	Pipeline Rupture	No. 2 Fuel Oil	5,000 gallons	Groundwater, pumping
?	Tank leakage/ Overflow	Fuel Oil	unknown	None

Source: Tsai et al., 1988.

I'ABLE 10-2 SUMMARY OF THE REMEDIAL INVESTIGATION FIELD PROGRAM -OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		ld	Program Elements	
SITES	SOIL VAPOR SURVEY	REMOTE SENSING GEOPHYSICS	MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING*	SOIL BORINGS AND SOIL SAMPLING
Old Acid Area	1	1	3 new wells; 8 samples from 3 new and 1 existing wells	3 deep borings, 5 samples from each; 10 shallow borings, 2 samples from each
Old Fuel Oil Tank	1	;	1 new well; 2 samples from the new welf	2 borings, 5 samples from each

Notes:

* Includes 2 rounds of groundwater sampling

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TABLE 10-3 SUMMARY OF BORINGS COMPLETED OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

OF SOIL TOTAL NUMBER OF SUBSURFACE SAIL SAMPLES FOR CE (#) SAMPLES CHEMICAL ANALYSIS PURPOSE	This deep boring was drilled directly downgradient of the	nitric acid and sulfuric acid concentration facilities to determine whether residual contamination exists in the soil directly downgradient of these potential source areas.	This boring was drilled downgradient of the Old Acid Area storage tank to provide chemical data to characterize the type and vertical distribution of residual subsurface soil contamination.	This boring was drilled downgradient, adjacent to waste acid neutralization facility to characterize the vertical distribution of subsurface soil contamination near the facility.	0 NA - 2	0 NA 2	0 NA 2	0 NA 2	NA 2	NA 2 evaluate the areal extent of shallow soil contamination.	S 2	0 NA 2	0 NA 2	
BORING FROM GROUND SPLIT-SPOO SURFACE (#) SAMPLES	92 14		92 13	13	AN O.E	2.0 NA	2.0 NA	2.0 NA	3.0 NA	2.5 NA	2.5 NA	3.0 NA	3.0 NA	-
BORING B NUMBER	Old Acid Area		OAB-91-02	OAB-91-03	OAB-91-041	OAB-91-051	OAB-91-061	OAB-91-071	OAB-91-081	OAB-91-091	OAB-91-101	OAB-91-111	OAB-91-121	100

TABLE 10-3 SUMMARY OF BORINGS COMPLETED OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

PURPOSE	This boring was driffed at the location of a former fuel oil storage tank to characterize the type and vertical distribution	of residual contamination.	This boring was drilled downgradient of the former fuel oit storage tank and upgradient of the most recent fuel oil spill as reported by BAAP in May 1991
NUMBER OF SUBSURFACE SOIL SAMPLES FOR CHEMICAL ANALYSIS		w	ທ
TOTAL NUMBER OF SPLIT-SPOON SAMPLES		13	13
DEPTH OF SOIL BORING FROM GROUND SURFACE (#)		92.0	89.0
BORING NUMBER	Oil Fuel Oil	FTB-91-01	FTB-91-02

¹ OPB-91-04 through OAB-91-13 were collected using hand bucket auger. ft = feet NA = not applicable

TABLE 10-4
SUMMARY OF MONITORING WELLS INSTALLED OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

DRILLING METHOD Hollow-stern augers	BORING DEPTH FROM GROUND SURFACE (ft.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION Downgradient of the former acid storage tanks.	PURPOSE To provide water quality definition downgradient of the old acid production facility and the acid storage tanks that reportedly leaked.
Hollow-stem augers	102	772.4	8	Downgradient of the former waste acid treatment facilities.	To provide water quality data at the water table approximately 600 feet downgradient of the waste acid neutralization facility.
Dual-wall driven casing	100:0	779.6	01	Downgradient of the Old Acid Plant.	To provide groundwater flow data and assess groundwater quality downgradient of the Old Acid Plant.
Hollow-stern augers	103	772.9	8	Downgradient of the fuel oil spill site.	To provide water quality data at the water table approximately 150 feet downgradient of the former fuel oil tank.

Notes:

ft = feet MSL = Mean Sea Level

TABLE 10-5 WELLS INCLUDED IN GROUNDWATER SAMPLING PROGRAM OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITES	New Wells	Existing Wells		
Old Acid Area	OAM-89-01 OAM-89-02 OAM-91-01	\$1126		
Subtotal	3	1		
Old Fuel Oil Tank	FTM-89-01			
Subtotal	1	0		
TOTAL WELLS	4	1		

TABLE 10-6
CHEMICAL ANALYSES PERFORMED ON SUBBURFACE BOIL SAMPLES -OLD ACID AREA OLD FUEL OIL TANK

1

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

								INORG	INORGANICS					\vdash	ľ	OTHER	\vdash		ľ	ORGANICS	8	Γ
				METALS	8				TCLP	TCLP METALS	8	H	ANONS									_
SAMPLE LOCATION	2	ĭ	8	5	Ŧ	빞	ž	2	8	5	Ξ S	2	N F	8	20	F	PH TPHC VOC BNVA	8		2	MAN S	TWO DMT
OLD ACID AREA														ĺ								Γ
OAB-91-01	I	1	ĸ	40	1	ì	S	Y)	1	ı	i	1	10	40	ı	9	1	so.	ł	ı	1	1
OAB-91-02	I	1	10	40	i	ı	S	10	ı	1	ı	1	νo	ĸ	1	40	1	w	t	ı	ı	1
OAB-91-03	i	I	40	10	i	ł	9	\$	1	ı	1	1	v	40	ı	10	1	40	ı	ı	1	1
OAB-91-04	t	ı	١	I	1	I	1	ı	1	ļ	ı	ı	~	~	ı	ı	ı	ı	i	i	i	ī
OAB-91-05	1	1	1	1	1	I	1	1	1	ı	1	ı	7	8	ı	ŧ	!	1	ı	1	1	ī
OAB-91-06	1	I	1	ł	ì	1	I	1	ı	1	ı	ı	7	~	ł	ŧ	1	ı	ļ	1	ı	1
OAB-91-07	ı	1	I	ı	١	1	I	1	I	ł	1	1	8	~	ı	l	ļ	1	1	1	1	1
OAB-91-08	1	1	1	ļ	}	1	ŀ	1	ı	1	ı	1	8	8	ı	ţ	ı	ı	i	ł	ı	1
OAB-81-09	I	1	١	ŀ	١	1	I	I	1	ì	1	ı	8	~	i	l	ı	ı	1	I	1	1
OAB-91-10	i	ı	t	ı	1	ı	ı	ı	1	ŀ	1	1	~	~	1	ı	1	ı	ı	ı	1	ī
OAB-01-11	1	ı	1	ł	ł	ļ	I	1	١	i	ı	ı	8	~	ı	1	1	ı	ı	1	ł	ī
OAB-91-12	i	I	1	I	١	1	1	1	ı	İ	1	1	8	8	1	ı	1	ı	1	1	1	ī
OAB-91-13	1	ı	I	1	١	i	I	1	I	t	ı	ı	~	~	1	ŧ	1	1	ı	1	ı	1
OLD FUEL OIL TANK																						
FTB-91-01	ı	i	1	t	1	ı	1	1	1	ı	1	ı	1	ı	ı	ŧ	40	40	40	ı	ı	1
FTB-01-02	ļ	1	ı	I	1	I	İ	ı	1	1	1	1	1	1	1	ı	9	•	w	ı	1	1
TOTALS	•	•	5	5	9	•	5	5	•	•	•	•	3	*	0	5	5	×	5	•	•	•
						į																_

NOTES:

PP = Priority Pollutent Metale (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)
TAL = Toxic Analyte List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)
VOC = volatile organic compounds by GCMf?

GC/MS = Gas Chromatography/Mass Spectrometry BN/A = base-neutral and acid-extractable organics by GC/MS

NAM = nitrosemines by GC

DNT = 2,4- and 2,6-dinitrotoluene by HPLC HPLC = High Performance Liquid Chromatrography

USA012.wk1

TABLE 10-7 CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

								INORGANICS	ANICE						1				P	MAANICS	83	F	E
					METALS	1.8			r	ANIONS	NS	\vdash		OTHER	g,								
SAMPLE LOCATION	PP 74	7	ð	CA NA CD	ŝ	5	9	2	Ī	Ę	ರ	<u>\$</u>	S S	A EX	108	20	NIT CL 804 HARD ALK TDS TOC NH3NZ VOC BN/A NG NAM DNT	NOC DE	_ ≨	Z	3	_	
OLD ACID AREA									1			1									1		Τ
OAM-89-01	1	1	-	-	-	-	ı	0	-	6 0	œ	00	8	8	0	1	I	•	ı	t		ı	1
OAM-49-02	1	ì	-	-	-	-	t	6 0	-	œ	00	0	60	80	40	1	ì	8	l	ı	· !	1	ī
S1126	١	I	-	-	-	-	ı	œ	-	00	∞	œ	8	8	∞	ı	i	6	1	i	•	1	1
OAM-81-01	1	ı	-	-	-	-	ı	6	-	•	80	∞	60	20	80	1	1	0	1	1	1	1	l
OLD FUEL OIL TANK FTM-89-01	1	ı	!	1	t	Į l	1	1	1	۵	•	₩.	•	80	•	1	1	•	•	1	, 1	1	60

NOTES:

PP = Priority Pollutant Metals (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)

TAL = Toxic Analyse List (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCAMS

GCAMS = Gas Chromatography/Mass Spectrometry

BN/A = base—neutral and acid—extractable organics by GCAMS

NAM = nitroaamines by GC

DNT = 2,4- and 2,6-dinitrotoluene by HPLC

HPLC = High Performance Liquid Chromatography

B = Analyzed in Both Rounds (One and Two).

1 = Analyzed in Round One Only.

USA017.WK1

TABLE 10-8 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS OLD ACID AREA/OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (cm/sec)	GEOLOGIC CONDITIONS
OAM-89-01	3.1	2x10 ⁻²	Medium to fine sand (SP)
FTM-89-01	3.6	3x10 ⁻²	Medium to fine sand (SP)

Notes:

Hydraulic Conductivity Tests completed during March and November, 1989, and November and December 1991.

Field data and calculations are presented in Appendix I.

Values for hydraulic conductivities represent an averaged value of multiple tests performed on each well.

Water level recovery at these wells impacted by inertial effects, resulting in water level recovery above static water levels. Hydraulic conductivity measurements may be greater than the calculated values at these wells.

cm/sec = centimeters per second

TABLE 10-9
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		FTB-91-01	FTB-91-01	FTB-91-01	FTB-91-01	FTB-91-01	FTB-91-02	FTB-91-02	FTB-91-02	FTB-91-02	FTB-91-02
Sample Type:		BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
UNITS		000	000	000	nge	000	000	990	990	990	990
DATE SAMPLED:	PLED:	10/27/01	10/22/01	10/22/91	10/22/91	10/22/91	10/22/01	10/22/01	10/22/91	10/27/01	10/27/91
DEPTH		2.000	7.000	12.000	17.000	92.000	2.000	9000	11.000	21.000	89.000
700 0	ACET	,	ı	ţ	ı	ł	1	,	ı	,	1
	CH2CL2	,	1	1		1	1	•	1	,	•
	MEK	,	1	ı	ı	ı	ı	1	1	•	ı
SVOCs	SMNAP	,	1.070	1	1	1				J	
	ANAPNE	,	0.077	1	,	ı	١,	•	•	•	,
	BZEHP	J	ı	1	•	1	ı	1.230	1.800	ì	ı
	BAANTR	,	0.080	0.118	1	ı	0.122	1	ı	•	1.380
	BGHIPY	ı	0.396	ı	,	•	•	ı	ı	1	,
	CHRY	,	0.076	0.113	1	•	ı	ı	1	ì	,
	DNBP	,	•	2.100	•	•	ı	•	•	1	,
	FANT	,	0.037	ı	ı	ı	1	•	•	ı	,
	FLRENE	,	0.160	•	1	1	•	•		i	1
	PHANTR	ı	0.194	0.088	ı	ı	ı	ı	,	•	,
Metals	S.										
	Z										
	P.B										
Anions	EX										
	204										
Indicator	pH(1)										
parameter	THC THC	430.000	1180.000	ı	21.800	1	•	ı		1	ı

TABLE 10-9
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID: Sample Type: UNITS:		OAB-91-01 BORE UGG	OAB-91-01 BORE UGG	OAB-91-01 BORE UGG	OAB-91-01 BORE UGG	OAB-91-01 BORE UGG	OAB-91-02 RORE UGG	OAB-91-02 BORE UGG	OAB-91-02 BORE UGG	0AB-91-02 BORE UGG	0AB-91-02 BORE UGG
DATE SAMPLED: DEPTIE	PLED:	10/09/91	16/66/61	10/09/91	10/09/91	91.000	10/09/91	10/09/91 7.000	10/09/91	10/09/91	10/09/91
VOC	ACET	1	ı	0.004 S	0.002 S	0.004 S	ı	0.008 S	ı	ı	1
	CH2CL2 MEK	- 0.006 S	- 0.008	0.007 S	S 900'0	0.007 \$	S 9000	- 0.008 S	0.006 S	0.002 S	1 1
SVOCE	2MNAP ANAPNE										
	BZEHP										
	BGHIPY										
	DNBP										
	FANT										
	FLRENE										
Metals	CR	14.400	17.600	3.880	3.810	3.820	16.400	13.500	2.400	1.280	6.880
	Z	26.900	17.300	4.810	3.190	1	20.100	11.600	8.360	009.4	3.110
	8 8	1500.000	64.000	3.240	4.630	0.726	4.870	240.000	3.030	2.880	15,000
Anions	TIN	1.380	8.280	2.780	1.930	1.240	-	2.610	1.520	1.720	2.300
	\$0 1	3900:000	240.000	53.200	32.100	ı	31.300	2500.000	350.000	\$6.800	27.400
Indicator	pH(I)	7.880	9.280	9.020	9.140	10.400	090'6	8.440	8.440	8.930	11 100
Principle	TI III										

TABLE 10-9
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		OAB-91-03	OAB-91-03	OAB-91-03	OAB-91-03	OAB-91-03	OAB-91-04	OAB-91-04	OAB-91-05	OAB-91-05	0AB-91-06
Sample Type:	•	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
UNITS		nec	000	000	000	990	nee	000	990	000	990
DATE SAMPLED:	PLED:	16/91/01	10/16/91	10/16/91	16/91/01	16/91/01	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91
DEPTH		2.000	9.000	11.000	21.000	000.16	0.000	2.000	0.000	2.000	0,000
2007	ACET	1	1	1	ı	ı					
	CH2CL2	,	0.002 S	1	1	1					
	MEK	•	ı	1	•	0.003 S					
SVOCE	2MNAP										
	ANAPNE										
	BZEHP										
	BAANTR										
	BGHIPY										
	CHRY										
	DNBP										
	FANT										
	FLRENE										
	PHANTA										
Metals	5	20.500	10.400	13.300	4.580	2.170					
	Z	17.300	7.840	14.800	2.910	•					
	2	11.000	3.920	8.600	2.700	0.845					
Anions	LX	1.740	2.210	1.980	2.220	3.040	1.450	1.180	1.470	1.450	
	204	130,000	36.000	44.800	ı	•	20000.000	2300.000	18000.000	16000.000	26 800
Indicator	(1)Hq	8.470	6.940	055.9	8.950	9.610					
oarameter	TPIC										

Notes and flagging codes are presented at the end of this table.

TABLE 10-9
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		OAB-91-06	OAB-91-07	0AB-91-07	OAB-91-08	OAB-91-08	OAB-91-09	0AB-91-09	OAB-91-10	OAB-91-10	OAB: 91-11
Sample Type:		BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
UNITS		000	nge	000	090	990	990	000	990	990	990
DATE SAMP	LED:	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91	10/03/91
DEPTH		1.500	0.000	1.500	1.000	2.000	0.000	2.000	0.000	2.000	000.0
VOC	ACET										
	CH2CL2 MEK										
SVOCe	2MNAP										
	ANAPNE										
-	BZEHP										
	BAANTR										
	BGHIPY										
	CHRY										
	DNBP										
	FANI										
	PHANTR										
Metals	CR										
	Z										
	2										
Anions	LIN		1.090	1.110	1	_		1.160	•	1.790	
	SO4	8200.000	5.780	16.000	170.000	36.200		•	1		
Indicator	pH(1)										
parameter	TPHC										

TABLE 10-9
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: BORE BORE UNITS: UGG UGG DATE SAMPLED: 1003991 1003391 DATE SAMPLED: 2,000 0,000 VOCs ACET CH2CL2 MEK SVOCs 2,000 0,000 ANAPNE B2HP BAANTR BGHIPY CHRY DNBP FANT FLRENE PHANTR NI PB Anions NI SO4 6,100 - Indicator PH(1) -	••		OAB-91-11	OAB-91-12	OAB-91-12	OAB-91-13	OAB-91-13
UGG 10/03/91 2000 ACET CH2CL2 MEK ANAPNE B2EHP BAANTR BGHIPY CHRY DNBP FANT FLRENE PHANTR CR NI PB NI PB NI PH(1) SOH PH(1)	: Type:		BORE	BORE	BORE	BORE	BORE
10/03/91 2,000 ACET CH2CL2 MEK 2MNAP ANAPNE B2EHP BASEHP BASHIPY CHRY DNBP FANT FLRENE PHANTR CR NI PB NI PB NI PB NI PH(1) SOM PH(1)	:		000	000	000	990	990
ACET CH2CL2 MEK 2MNAP ANAPNE BANTR BGHIPY CHRY DNBP FANT FLRENE PHANTR CR NI PB NI PB SOH SOH PH(1)	SAMPLED:		10/03/91	10/03/91	10/03/91	10/03/91	10/03/91
ACET CH2CL2 MEK 2MNAP ANAPNE BACHPP BACHTP BCHIPY CHRY DNBP FANT FIRENE PHANTR CR NI PB NI PH(1)	ä		2.000	0000	2.000	0.000	2.000
CH2CL2 MEK 2MNAP ANANE BANDE BAANTR BGHIPY CHRY DNBP FANT FIRENE PHANTR CR NI PB NI PB S04 6.100 PH(1)		ACET					
2MANAP ANAPNE BAANTR BAANTR BCHIPY CHRY CHRY DNBP FANT FIRENE PHANTR CR NI PB SO4 6.100 PH(1)	O	H2CL2					
ANAPNE B2EHP BAANTR BCHIPY CHRY CHRY FANT FLRENE PHANTR CR NI PB S04 6.100 PH(1)	-	MNAP					
B2EHP BAANTR BCHIPY CHRY ONBP FANT FLRENE PHANTR CR NI PB S04 6.100 PH(1)		NAPNE					
BAANTR BGHIPY CHRY DNBP FANT FIRENE PHANTR CR NI PB NI PB SO4 6.100 PH(1)		2EHP					
BGHIPY CHRY DNBP FANT FIRENE PHANTR CR NI PB NI PB S04 6.100 PH(1)	æ	ANTA					
CHRY DNBP FAUT FIRENE PHANTR CR NI PB NI PB S04 6.100 PH(1)	Ě	GHIPY					
FANT FLRENE PILANTR CR NI PB NI PB	•	HRY					
FANT FLRENE PHANTR CR NI PB NIT SO4 6.100 PH(1)	_	ONBP					
FLRENE PHANTR CR NI PB NI SO4 SO4 6.100	_	FANT					
PHANTR CR NI PB NIT SO4 6.100	巫	LRENE					
CR NI PB NIT - SO4 6.100	~	IANTA					
NI PB NIT - 5.100 SO4 6.100		CR					
PB - NIT - SO4 6.100		Z					
SO4 6.100		PB					
SO4 PH(1)		NIT		1.480	1.690	5.610	1
	į	804	9.100	1	12.400	1	16.600
		PH(3)					
_	_	THIC					

TABLE 10-9
SUMMARY OF SUBSURFACE SOIL CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
	n		Ħ	*				н	H		Ħ		Ħ	H
(E)	3	ngr	VOC	SVOCs	Blank cell		<u>1</u> 5	£	Ü	۵.	~	S	T	×

USATHAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results

TDOC.016

TABLE 10~10
SUMMARY OF GROUNDWATER CHEMICAL DATAOLD ACID AREA/OLD FUEL OIL TANK AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Net 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5				NAM- 80-01	10		OAN	M-89-02		-MAO	91-01	E	TM-89-0	-	S	126
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ACET 7.6 S - CH2CL2 4.31 P 4.22 P CHCL3 - CA 98000 85000 CR 7.54 - NA 7.54 - NA 7.54 - NA 7.54 - Or ALK 328000 33000 CL 4.3000 85000 SO4 90000 85000 SO4 90000 85000 TDS 457000 453000 DH(1) 7.3 7.5	COND		OIME				7,12		<u></u>	2.5						
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OF 7.54 NA 31000 NIT 5400 1200 CL 43000 39000 SO4 90000 85000 Her HARD 382000 453000 PH(1) 7.3 7.5	Alaba	S.	98000		85000		95000		00016	83000	72000				000	90000
NA 31000 NIT \$400 1200 CL 43000 39000 SO4 90000 85000 ier HARD 328000 45000 therefore the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	!	2	157		,		7.3		1	5.430	ı				3.	J
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ALK 328000 310000 HARD 382000 404000 TDS 487000 453000 PH(1) 7.3 7.5		203	90000		85000		76000		88000	21000	28000	360000	•	410000	00009	46000
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7.3		TDS	487000		153000		465000		480000	353000	280000	2060000	7	200000	463000	420000
		PH(I)	7.3		7.5		7.2		7.5	7.4	7.6	7.1		7.2	7.3	7
617 742	J.	Cond (2)	617		742		626		683	416	488	2370		766	209	637

TABLE 10-10
SUMMARY OF GROUNDWATER CHEMICAL DATAOLD ACID AREA/ OLD FUEL OIL TANK
REMEDIAL INVESTIGATION
BAIDGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
W	H		ú	Ħ	H		Ħ	Ħ	R	н	ı	Ħ		Ħ
ε	(2)	CCL	VOC	SVOCs	Blank cell	•	GT	œ	9	۵.	~	s	-	×

USATHAMA chemical codes are defined in the RI Report Glossary

TDOC:017

TABLE 10-11 COMPOUNDS OF POTENTIAL CONCERN OLD ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

	EXPOSURE POI	NT CONCENTRATION
COMPOUNDS OF POTENTIAL CONCERN	SURFACE SOIL ¹ (#g/g)	Surface through Subsurface Soil ² (vg/g)
ACET		0.008
CR	20.5	20.5
NI	56.9	56.9
NIT	5.61	8.28
PB	1,500	1,500
SO4	20,000	20,000

Notes:

- = Not identified as a compound of potential concern

Exposure point concentration is the maximum detected concentration

µg/g = micrograms per gram; equivalent to parts per million (ppm)

Assessment of surface soil contamination (0 to 2 feet) was performed using samples from horings

Assessment of surface soil contamination (0 to 2 feet) was performed using samples from borings OAB-91-01 through OAB-91-13.

Assessment of subsurface soil contamination (0 to 12 feet) was performed using samples from borings OAB-91-01 through OAB-91-13.

TABLE 10-12 SUMMARY OF RISK ESTIMATES OLD ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Current and Future Grounds Maintenance Worker	Soil Ingestion	ND	0.0003
	Inhalation of Particulates	ND	ND
	Total for Grounds Maintenance Worker	ND	0.0003
Future Residential	Soil Ingestion	ND	0.04
Future Construction Worker	Soil Ingestion	ND	0.01
	Inhalation of Particulates	2x10 ⁻⁶	<u>ND</u>
	Total for Construction Worker	2x10 ⁻⁸	0.01

Notes:

ND

not determined - no toxicity factors available for compounds of potential concern

TABLE 10-13 COMPOUNDS OF POTENTIAL CONCERN OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION **BADGER ARMY AMMUNITION PLANT**

	EXPOSURE POINT CONCENTRATION
COMPOUNDS OF POTENTIAL CONCERN	Subsurface Soil' (µg/g)
2MNAP	1.07
ANAPNE	0.077
B2EHP	1.8
BAANTR	0.122
BGHIPY	0.396
CHRY	0.113
DNBP	2.1
FANT	0.037
FLRENE	0.16
PHANTR	0.194

Notes:

Exposure point concentration is the maximum detected concentration

µ9/9 micrograms per gram; equivalent to parts per million (ppm)

Assessment of subsurface soil contamination (2 to 12 feet) was performed using samples from FTB-91-01 and FTB-91-02.

TABLE 10-14 SUMMARY OF RISK ESTIMATES OLD FUEL OIL TANK AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

EXPOSURE SCENARIO	EXPOSURE ROUTE	CANCER RISK	HAZARD INDEX
Future Construction Worker	Soil Ingestion	9x10 ⁻⁹	0.001
	Inhalation of Particulates	5x10 ⁻¹¹	ND
	Total for Construction Worker	9x10 ⁻⁹	0.001

Notes:

ND

not determined - no toxicity factors available for compounds of potential concern.

COMPARISON OF GROUNDWATER TO STANDARDS OLD ACID AREA/OLD FUEL OIL TANK AREA UNITS: pg/\$ **TABLE 10-15**

BADGER ARMY AMMUNITION PLANT REMEDIAL INVESTIGATION

COMPOUNDS OF	FREQUENCY	MAXIMUM DETECTED	MINIMUM DETECTED	SDWA (1)	Ξ	WI GROU	WI GROUNDWATER Standards (2)	CALCULATED
POTENTIAL	OF DETECTION	CONCENTRATION	CONCENTRATION	MCL	MCLG	ES	PAL	CONCENTRATION (3)
CHCL3	5:10	3.22	0.704			9	9.0	•
ಕ	10:10	1,200,000	4,200	250,000(a)	•	20,000(c)	125,000(c)	•
5	8:4	9.64	5.43	100	100	(p)0S	2(q)	•
N A	4:8	32,000	10,000	20,000(b)	•	,	•	•
LIN	10:10	5,400	1,100	10,000	10,000	10,000	2,000	•
SO4	10:10	410,000	21,000	250,000(a)	-	250,000(c)	125,000(c)	•

Sources:

U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards." Office of Water, Washington, D.C., August 1991; EPA, 1991, "Fact Sheet: National Secondary Drinking Water Standards," Office of Water, Washington, D.C., September 1991; and EPA, 1990, "National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule," S7FR31776, July 17, 1992 (see Subsection 3.6 for details). Wisconsin Administrative Code, Chapter NR 140.10, Table 1 (see Subsection 3.6 for details).

4.5 for details). Calculated to be protective at risk of 10th of 1 (see to ଉ ଡ

Notes:

Secondary drinking water standard, suggested level. @ <u>@</u> ©

Reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet. Value for protection of human welfare (usually aesthetic concerns) rather than protection of public health.

micrograms per liter **2**/8

Safe Drinking Water Act SDWA

Maximum Contaminant Level Goal MCLG 텇

Maximum Contaminant Level

Wisconsin

Enforcement Standard Preventive Action Limit Treatment technique requirement in effect Copper action level = $1,300 \mu g/t$

WI proposing change to ES = 100 μ g/fand PAL = 10 μ g/f Lead action level = $15 \, \mu g/t$ 5

TABLE 10-16 ECOLOGICAL CONTAMINANTS OF CONCERN^A OLD ACID AREA

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

COMPOUND	FREQUENCY	EXPOSURE POINT CONCENTRATION ⁸
Surface Soil		
NI	3:3	56.9
NIT	13:23	1.79
PB	3:3	1,500
SO4	16:23	18,000

Notes:

- Constitutents selected based on criteria presented in Table Q-25 and discussed in Section 5.0.
- 95th percentile or maximum; units in μ g/g.
- Assessment of surface soil contamination (0 to 2 feet) was performed using samples from borings OAB-91-01 through OAB-91-13.

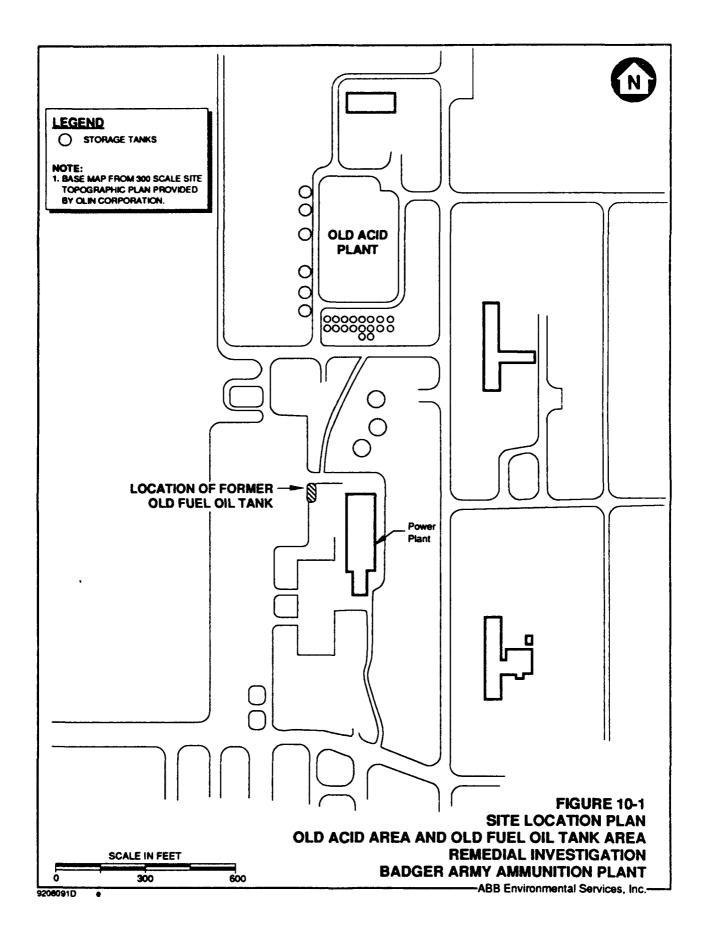
TABLE 10-17 SUMMARY OF RISK EVALUATION FOR TERRESTRIAL RECEPTORS OLD ACID AREA

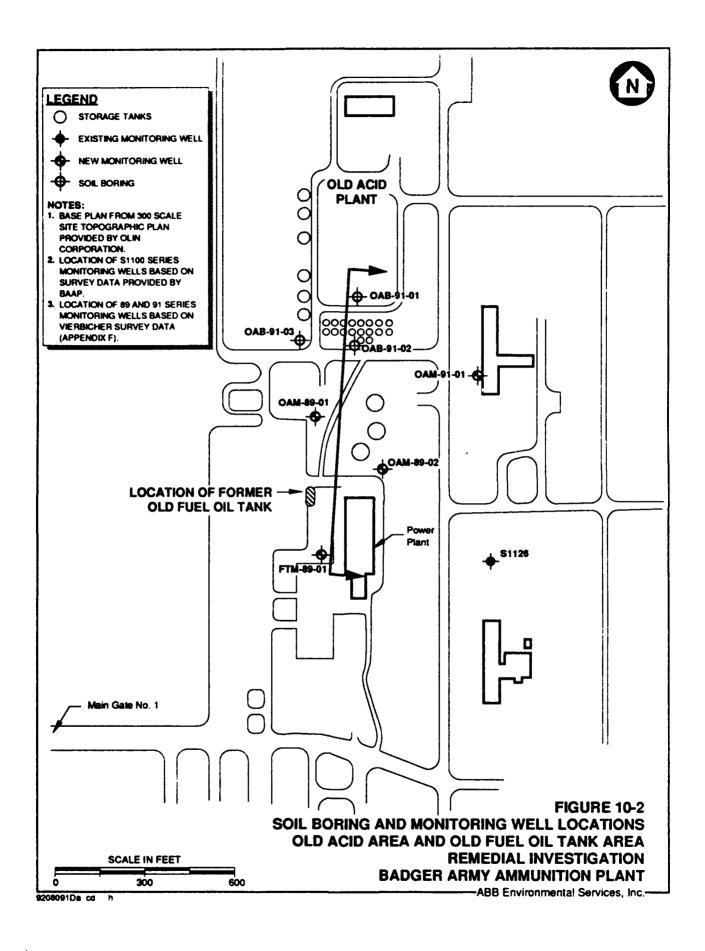
REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

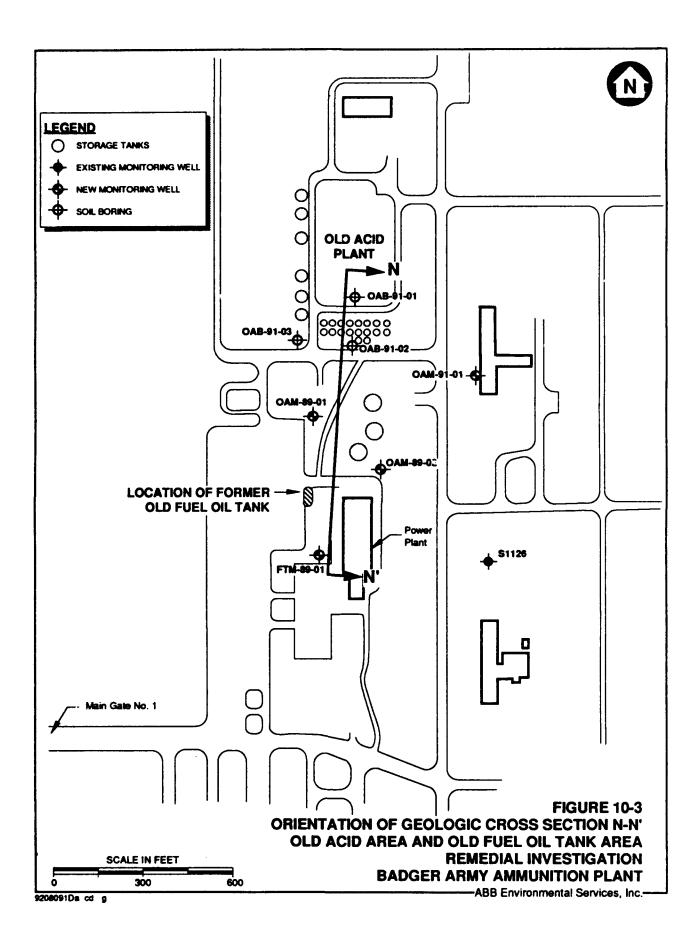
	HAZARD	INDICES"
RECEPTOR	ACUTE RISK ^b	CHRONIC RISK®
Short-tailed shrew	2.8E+03	5.7E+04
Eastern meadowlark	6.3E+01	1.8E+02
Garter snake	1.4E+02	2.8E+03
Red fox	3.1E+00	1.3E+00
Red-tailed hawk	9.8E+00	2.0E+00

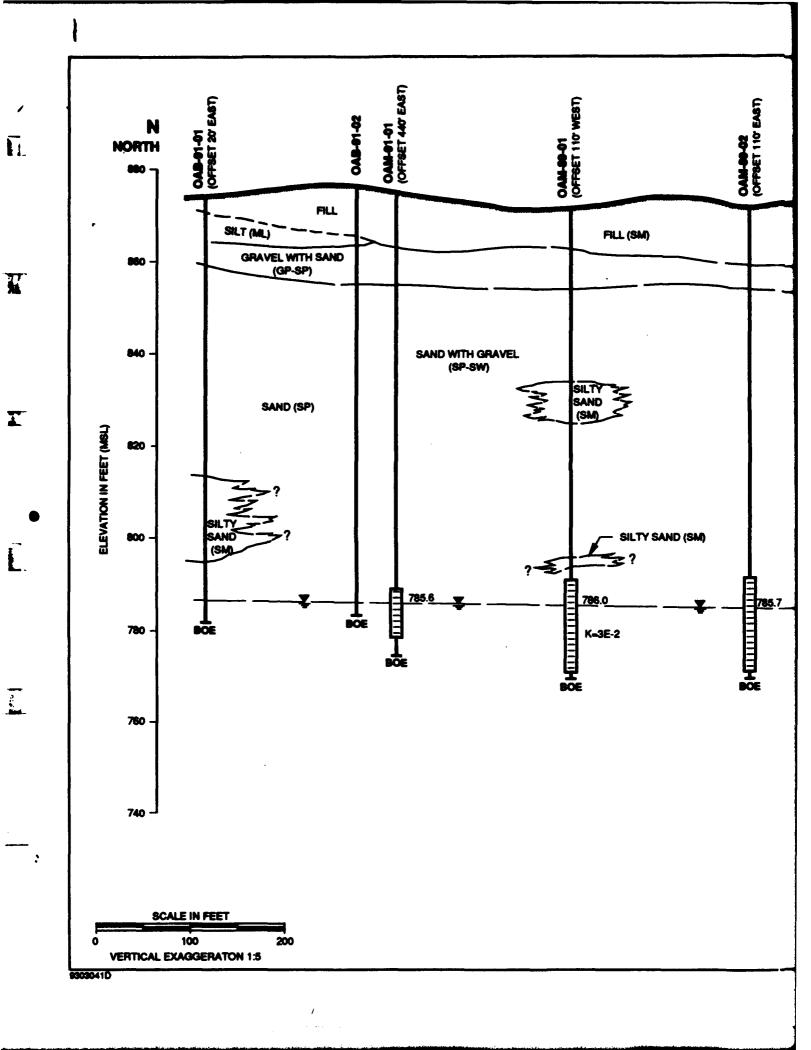
Notes:

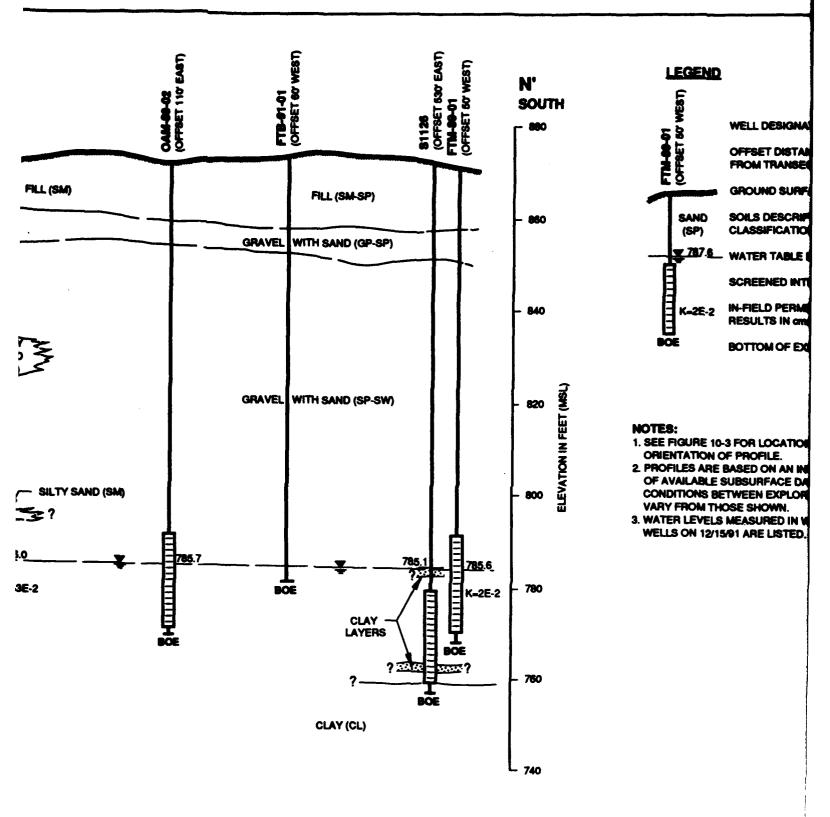
- Sum of the individual Hazard Quotients for each surface soil contaminant of concern; each HQ calculated by dividing the estimated exposure dosage by the Reference Toxicity Value (RTV). Hazard Quotients are presented in Appendix R, Tables R-59 and R-60 for acute and chronic exposures, respectively.
- Based on comparison to acute RTVs.
- Based on comparison to chronic RTVs.











GEOLOGIC CROSS SE OLD ACID AREA AND OLD FUEL OIL 1 REMEDIAL INVE BADGER ARMY AMMUNIT

-ABB Environmental

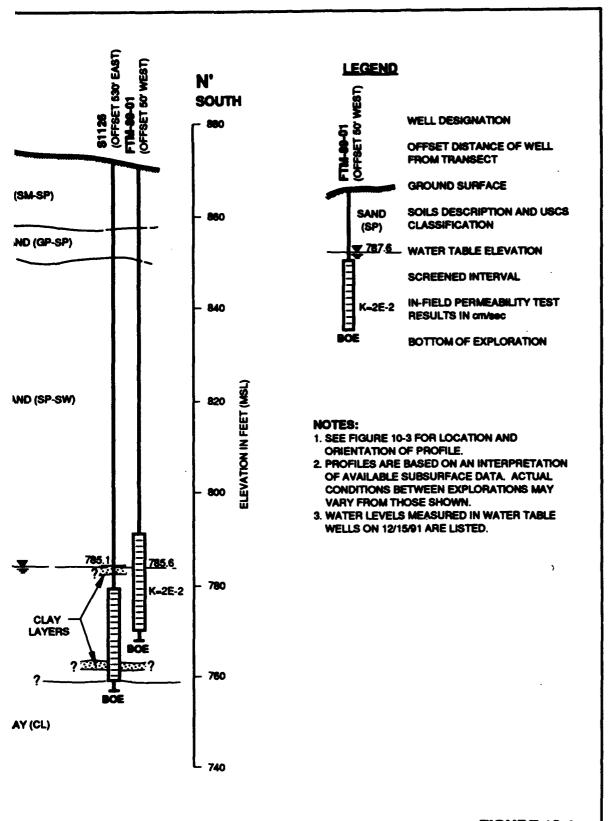
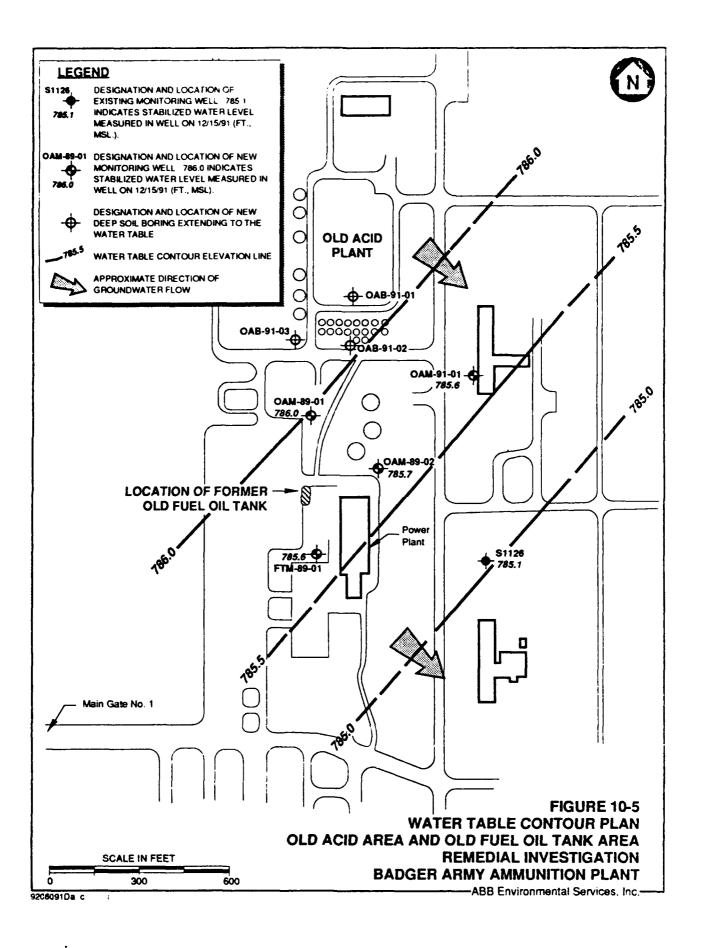
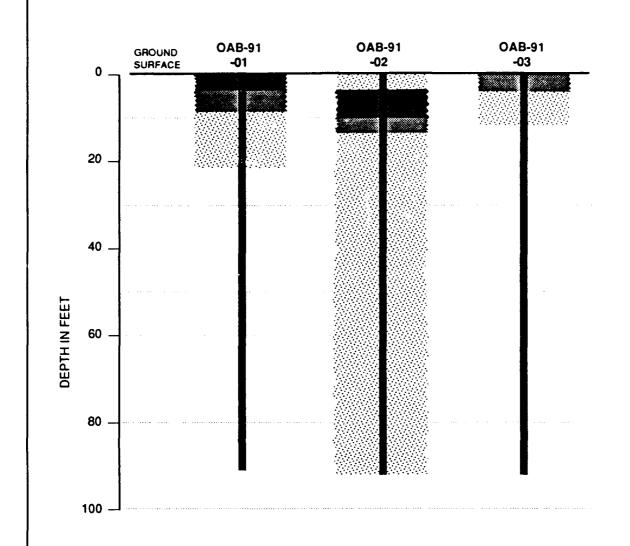
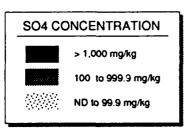


FIGURE 10-4
GEOLOGIC CROSS SECTION N-N'
OLD ACID AREA AND OLD FUEL OIL TANK AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.







NOTE:

1. SEE TABLE 10-9 AND APPENDIX K FOR CHEMICAL DATA SUMMARY.

FIGURE 10-6
SO4 CONCENTRATIONS IN
SUBSURFACE SOILS
OLD ACID AREA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

-ABB Environmental Services, Inc.-

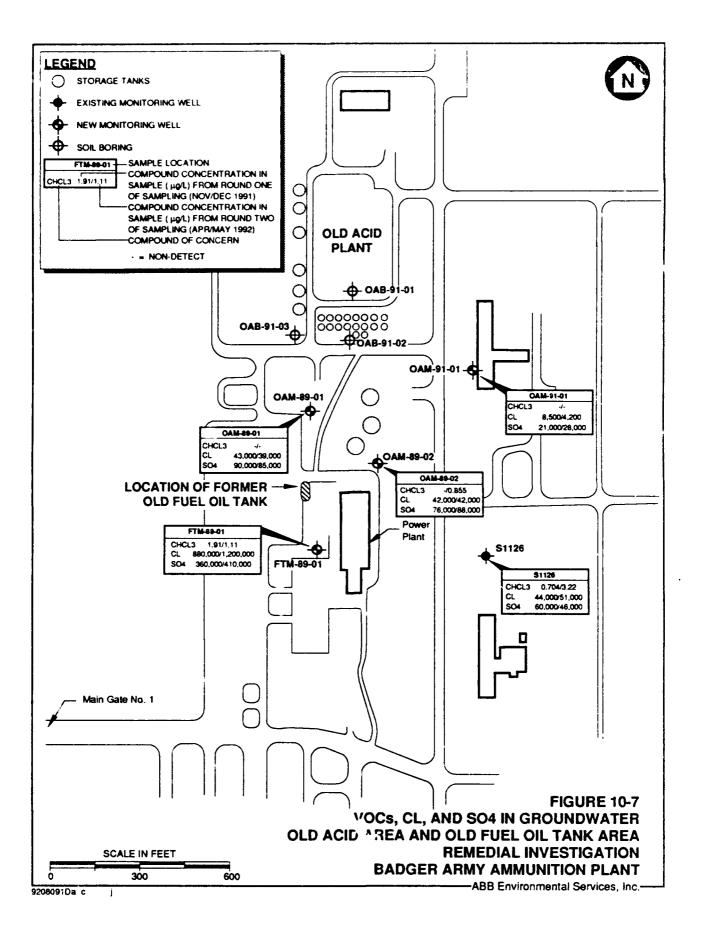


TABLE 11-1 SUMMARY OF THE REMEDIAL INVESTIGATION FIELD PROGRAM -OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		ď	PROGRAM ELEMENTS	
SITES	SOIL VAPOR SURVEY	Remote Sensing Geophysics	MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING*	SOIL BORINGS AND SOIL SAMPLING
Off-Post Area South of BAAP	-		24 new wells; 48 samples from 24 new wells	ı

Notes

^{*} includes 2 rounds of groundwater sampling

TABLE 11-2 SUMMARY OF MONITORING WELLS INSTALLED -OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

		BORING DEPTH	BOTTOM ELEVATION	LENGTH OF		
SITE AND WELL IDENTIFIER	DRILLING METHOD	FROM GROUND SURFACE (ft.)	OF SCREENS (ft. MSL)	WELL SCREEN (ft.)	LOCATION	PURPOSE
PBM-90-01 D	Dual-wall driven casing	217.0	618.5	10	Downgradient and off-post of BAAP	To provide horizontal definition to the plume.
PBM-90-02 D	Dual-wall driven casing	214.0	614.2	10	Downgradient and off-post of BAAP	To provide horizontal definition of the plume.
PBM-90-03	Dual-wall driven casing	205.0	613.4	10	Downgradient and off-post of BAAP	To provide horizontal definition of the plume.
PBN-90-04 B -04 D	Dual-wall driven casing Dual-wall driven casing	B - 130.0 D - 237.0	B - 708 D - 627.5	10 10	Downgradient and off-post of BAAP adjacent to water tank	To provide horizontal and vertical definition of the plume.
PBN-91-01 C	Dual-wall driven casing	160.0	675.5	10	Downgradient and off-post of BAAP	In association with existing well PBM-90-01D, to provide horizontal and vertical plume definition.
PBN-91-02 B -02 C	Dual-wall driven casing Dual-wall driven casing	B - 115.0 C - 161.3	B - 704.0 C - 658.6	0 0	Downgradient and off-post of BAAP	In association with existing well PBM-90-02D, to provide horizontal and vertical plume definition.

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TABLE 11-2 SUMMARY OF MONITORING WELLS INSTALLED -OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITE AND WELL IDENTIFIER	DRILLING METHOD	BORING DEPTH FROM GROUND SURFACE (#.)	BOTTOM ELEVATION OF SCREENS (ft. MSL)	LENGTH OF WELL SCREEN (ft.)	LOCATION	Purpose
PBN-91-03 B -03 C	Dual-wall driven casing Dual-wall driven casing	B - 106.1 C - 152.3	B - 706.7 C - 660.0	10 10	Downgradient and off-post of BAAP	In association with existing well PBM-90-03D, to provide horizontal and vertical plume definition.
SWN-91-01 B -01 C -01 D	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing	B - 113.1 C - 160.1 D - 200.2	B - 717.1 C - 672.8 D - 633.4	10 10 10	Downgradient and off-post of BAAP along County HWY Z	To provide horizontal and vertical definition of the plume.
SWN-91-02 C -02 D	Dual-wall driven casing Dual-wall driven casing	C - 155.0 D - 190.2	C - 681.9 D - 649.5	10 10	Downgradient and off-post of BAAP along County HWY Z	To provide horizontal and vertical definition of the plume.
SWN-91-03 B -03 C -03 D -03 E	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing	B - 113.4 C - 162.8 D - 209.1 E - 258.0	B - 721.3 C - 671.8 D - 625.9 E - 597.1	10 10 10	Downgradient and off-post of BAAP along County HWY Z	To provide horizontal and vertical definition of the plume and to assess vertical gradient between bedrock and overburden
SWN-91-04 C -04 D	Dual-wall driven casinด Dual-wall driven casing	C - 164.0 D - 197.0	C - 668.8 D - 636.5	10 10	Downgradient and off-post of BA&P along County HWY Z	To provide horizontal and vertical definition of the plume.

TABLE 11-2 SUMMARY OF MONITORING WELLS INSTALLED -OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

PURPOSE	Downgradient and To provide horizontal off-post of BAAP and vertical definition of along County the plume.
LOCATION	Downgradient and off-post of BAAP along County HWY Z
LENGTH OF WELL SCREEN (ft.)	10 10 10
BOTTOM ELEVATION OF SCREENS (ft. MSL)	B - 718.0 C - 683.8 D - 630.7
BORING DEPTH FROM GROUND SURFACE (ft.)	B - 112.5 C - 147.0 D - 202.4
DRILLING METHOD	Dual-wall driven casing Dual-wall driven casing Dual-wall driven casing
SITE AND WELL IOENTIFIER	SWN-91-05 B -05 C -05 D

TABLE 11-3 WELLS INCLUDED IN GROUNDWATER SAMPLING PROGRAM OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

SITES	New Wells	EXISTING WELLS	RESIDENTIAL WELLS
Off-Post Area South of BAAP	PBM-90-01D PBM-90-02D PBM-90-03D PBN-90-04B,D PBN-91-01C PBN-91-02B,C PBN-91-03B,C SWN-91-01B,C,D SWN-91-02C,D SWN-91-03B,C,D,E SWN-91-04C,D SWN-91-05B,C,D	None	Graf Premo Shaefer Spear
TOTAL WELLS	24	0	4

Notes:

B,C,D,E - Shallowest to deepest: B indicates shallowest; E indicates deepest well in a well nest.

TABLE 11-4 CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES OFF-POST AREA SOUTH OF BAAPPRIVATE WELLS

REMEDIAL INVESTIGATION BADGER APAY AMMUNITION PLANT

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OFF-POST WELLS SOUTH OF BAAP	HOFB	3																				
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PBN-81-01 C	i	1	1	1	•	60	•	60	ı	•			•	•	ı	1	Ī	•	I	ı	ŧ	1
PBIM-80-02 D*	1	1	I	I	60	60	60	∞	1	•	8	•	•	•	i	1	Ī	•	1	1	ı	1
PBN-01-02 B	١	I	1	Ì	60	60	•	8	1	•	•	60	-	•	ı	1		•	ı	1	i	1
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PBM-80-03 D*	I	ı	ı	ı	•	0	6 0	8	ı	6	8	•	-	•	•	1		•	1	ı	1	1
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PBN-90-04 D*	1	ì	ı	1	60	0	₩	•	1	•		60		6 0	1	1	_	•	ı	ı	ı	1
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CHEMICAL ANALYSES PERFORMED ON GROUNDWATER SAMPLES -OFF-POST AREA SOUTH OF BAAPIPHYATE WELLS TABLE 11-4

BADGER ARMY AMMUNITION PLANT PEMEDIAL INVESTIGATION

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NOTES:

PP = Priority Pollutant Metale (13) (AG, AS, BE, CD, CR, CU, PB, HG, NI, SB, SE, TL, ZN)
TAL = Toxic Analyae Liet (23) (AL, SB, AS, BA, BE, CD, CA, CR, CO, CU, FE, PB, MG, MN, HG, NI, K, SE, AG, NA, TL, V, ZN)

VOC = volatile organic compounds by GCAAS

GCMS = Gas ChromatographyMass Spectrometry BWA = base-neutral and acid-extractable organics by GCMS

NAM = nitrosamines by GC

DNT = 2.4- and 2.6-dinitrotoluene by HPLC

HPLC = High Performance Liquid Chromatrography

* = Welts were analyzed for select VOCs during Round I (September 1990) and Round II (October 1990).

B = Analyzed in both Rounds (One and Two).

1 = Analyzed in Round Round One Only.

2 = Analyzed in Round Two Only.

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TABLE 11-5 FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

WELL DESIGNATION	MAXIMUM WATER LEVEL DEPRESSION (FEET)	HYDRAULIC CONDUCTIVITY (CM/SEC)	GEOLOGIC CONDITIONS
SWN-91-03B	5.8	2.6×10 ^{-2 a}	Coarse sand and gravel (SP-GP)
SWN-91-03C	8.0	1.8x10 ^{-2 a}	Medium to coarse sand (SP)
SWN-91-03D	4.9	1.5x10 ⁻² a	Coarse sand (SP)
SWN-91-03E	7.8	1.0x10 ⁻³	Sandstone and dolomite bedrock

Notes:

Field data and calculations are presented in Appendix I. Hydraulic conductivities were calculated using the HVORSLEV method.

Hydraulic Conductivity Tests were completed during March and November, 1989, and November and December 1991.

Values for hydraulic conductivities represent an averaged value of multiple tests performed on each well.

Water level recovery at this well was impacted by inertial effects, resulting in water level recovery above static water levels. Hydraulic conductivity measurements may be greater than the calculated values at this well.

cm/sec = centimeters per second

TABLE 11-6
SUMMARY OF GROUNDWATER CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Site ID:		PRM	PRM-90-01D	PRM-9	0-010	PRM-	M-02D	PRM	100 m	PRV	Q10-040
Sample Type: UNITS:		3.0	WELL	WELL		M	WELL	5 3	WELL	₹⊃	WELL
DATE SAMPLED: ROUND:	PLED:	09/24/90	10/22/90 II	12/15/91 ONE	04/24/92 TWO	09/25/90 I	10/23/90 II	12/08/91 ONE	04/28/92 TWO	09/25/90	10/23/90
VOCs	ACET			_	•			•			
	+TOO	1	1	ı		ı	1.68	2.16 P	3.53 P	1	-
	CH2CL2			4.8 P	6.67 B			4.02 P	7.25 8		
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	MEK	ı	ı	1 1	i i	ı	,		1 1	ı	1
SVOCs	2E IHXL		***************************************								
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Anions	FX			9069	0095			\$200	3200		
	C			31000 P	29000 P			0089	9100		
	804			20000	\$2000			38000	39000		
Indicator	ALK			231000	262000			269000	200000		
parameter	HARD			256000	338000			370000	284000		_
	10 8			419000	404000			272000	303000		
	pH(1)	7.5	1.7	7.7	7.8	7. 7	7.6	7.5	8.0	7.6	7.6
	Sp.Cond.(2)		522	£ F \$	642	43	398	35.	482	463	395

TABLE 11-6
SUMMARY OF GROUNDWATER CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Side III		MY OUT OF	200	12.2	106-1XEL	2	26-NB4	25-
ACET CCL4 CCL4 CH2CL2 CCL4 CH2CL2 CH2CL2 CH2CL2 A 9 P CHCL3 MEK A 60 S TRCLE BA CA CA CB CA CB CA CB CA CB CA CB CA CB CA CB CA CB CA CB CA CB CA CA CA CA CA CA CA CA CA CA CA CA CA		WELL	WELL	3 7	MELL		WELL	
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Notes and flagging codes are presented at the end of this table.

TABLE 11-6
SUMMARY OF GROUNDWATER CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

City ID) TO NEG	01-010	aco_10_Nag	1_02B	20-10-NBG	11-03	010_010	1-02B	NGG	DED OF OTHER
Sample Type	•	1 N		WE!	11	Y¥	11	1 N	11		~~~~
UNITS		ă	UGL	ner	ני: {	์	UGL	UGL	1	Š	rg C
DATE SAMPLED:	PLED:	12/15/91 ONE	04/24/92	12/07/91 ONE	04/28/92	12/07/91	04/28/92 TWO	12/14/91 ONE	04/28/92	12/14/91 ONE	04/28/92
NO.		7,10	22.	7117		CIVE		AU.E		AUS.	2
VOC	ACET	i	i	,	ı	1	7.4 S	1	ı	1	i
	7100	,	•	1	2.94 P	1	ı	•	ı	1	ı
	CH2CL2	4.8 P	6.76 B	4.9 P	7.25 B	4.9 P	7.65 B	4.71 P	7.45 B	4.41 P	7.84 B
	CHCL3	1	1	1	0.493 P	ŧ	1	1	•	1	ı
	MEK	1	1	1	ı	39 S	9.7 S	1	•	\$ O †	120 S
	TRCLE	1	1	1	ı	1	1	1	1	1	1
SVOC	2E IHXL										
	BZEHP	30.3 P	39.8 P	25.5 P	31.5 P	9.62	1	1		255	29.8 P
Metals	BA										
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	804	00009	20000	20000	45000	49000	\$1000	28000	28000	21000	21000
Indicator	ALK	284000	222000	266000	268000	\$20000	202000	227000	250000	228000	244000
parameter	HARD	330000	366000	372000	406000	370000	350000	368000	360000	314000	310000
	1 08		272000	419000	460000	369000	268000	463000	383000	419000	323000
	pH(1)		7.7	8.1	7.8	9	7.8	7.6	7.7	7.8	7.8
	Sp.Cond.(2)		716	783	701	169	9	LLS	859	487	\$62

Notes and flagging codes are presented at the end of this table.

TABLE 11-6
SUMMARY OF GROUNDWATER CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Suc 1D: Sample Type: UNITS: DATE SAMPLED: ROUND: CCL4 CCL4 CCL4 CHCL3 MEK TRCLE SVOCs ZEIHXL BAEHP Metals CA CCA CCCA CCCA CCCA CCCA CCCA CCCA	12/14/91 ONE	WELL UGL 04/25/92	N N	WELL	WE	WELL	WELL	. .	WE	WELL
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ACET CCL4 CHCL3 CHCL3 MEK TRCLE 2EIHXL BAEHP BA CA CA CA	. 11		-		ວ	3	2	7.	วั	
ACET CCL4 CH2CL2 CHCL3 MEK TRCLE ZEHXL BA BA CA CA	- CO		12/14/91	04/25/92	12/14/91 ONE	04/25/92	12/14/91 ONE	04/26/92 TWO	12/14/91 ONF	04/26/92 TWC
ACET CCL4 CH2CL2 CHCL3 MEK TRCLE SEHFXL B2EHP BA CD CR	1	OMI	ONE	2	4.15					
CCL4 CH2CL2 CH2CL3 MEK TRCLE TRCLE 2E IHXL BA BA CD CD		;	13 S	ı	1	1	1	ı	ŧ	ı
CH2CL2 CHCL3 MEK TRCLE ZEIHXL B2EHP BA CA CD CR	1	1	1	•		1	ı	ı	1	ı
CHCL3 MEK TRCLE ZEIHXL B2EHP BA CA CD CR	4.71	P 6.76 B	4.8 P	5.98 B	4.51 P	6.18 B	4.51 P	8.69 B	4.9 P	6.47 B
MEK TRCLE 2E:HXL B2E:HP BA CA CD CR	1	1	•	ı	1	•	•	0.433 P	1	ı
TRCLE 2E.HXL B2EHP BA CA CD CR	1	ı	S.	79 S	•	1	J	ı	1	ı
2E.IHXL B2EHP BA CA CD CR	ı	1	1	1			1	•	-	
B2EHP BA CA CD CR	10	S	30 S				;	1	į	Š
CC CR	62.1	1	201	1	127	3	130	80.8 P	3	3
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700	300	20000	2000	OCOURS.	000936	000866	316000	SOUTH	208000	196000
ALA	0000	000007	000077	178000	34000	338000	354000	174000	278000	294000
parameter HARD 33	20400	3:3000	301000	401000	245000	401000	\$12000	263000	359000	251000
	20400	9000	3,100	2000		20101	7.		-	10
	7.5	1.7	9.7		e i	1.7	• ;	: (: ;	: ;
	422	119	389	3 ,	36	\$68	424	673	878	<u> </u>

Notes and flagging codes are presented at the end of this table.

TABLE 11-6
SUMMARY OF GROUNDWATER CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: UNITS:		Š n	SWN-91-03B WELL UGL	G CT		SWN-91-0XC WELL UGL	WELL WELL UGL	1-03D 1L 3L	Z Z	SWN-91-03E WELL UGL		-X-8-0	WELL WELL UGL
DATE SAMPLED: ROUND:	LED:	12/11/91 ONE		04/28/92 TWO	12/11/91 ONE	04/27/92 TWO	12/11/91 ONE	04/27/92 TWO	12/11/91 ONE	04/27/92 TWO	1/92	12/14/91 ONE	04/25/92 TWO
VOC	ACET	ı		1	\$ 6.5	7.1	1	1	1	•		\$ 14	•
	CCI.4	7.25		10.8	i	2.75	ı	3.33 P	1	1		J	ı
	CH2CL2	4.71	۵.	7.16 B	4.71 P	7.55	4.71 P	7.84 B	4.9 P	7.75	2 2	4.51 P	7.06 B
	CHCL3	1.31		1.21	;	1	1	1	ı	1		ı	1
	MEK	89	s	130 S	16 S	38	S 5.5	1	S 3.	150	S	42 S	\$ 15
	TRCLE	ı		0.287 P	i	1	0.425 P	1	ı	ı		1	1
SVOCs	2E1HXL						30 S		10.0				
	BZEHP	\$0.8	۵.	62.1	49.4 P	28.7	73.2	139	97.1	7	•	6.99	ł
Metals	BA								24.8		24.3		
	5								74000	989	00089		
	CO	ı		1	ı	1	1	ı	ı	1		1	1
	CR	5.42		1	ı	ı	5.16	ı	\$.0	1		7.14	1
	Æ								27.4	•			
	HG	ı		,	ı	1	•	,	•	1		ı	1
	¥								L 896	. 152	F		
	MG								32000	230	8		
	Z								54.1	53	1		
	٧					•			25000 T	27000	1		
	PB	ı		1	ı	:	•	1	•	1		ı	•
Anions	TIN	18000		14000	1800	1800	0065	1300	2000	4400	8	7200	0009
	ರ	23000		23000	3100 P	4400	8000	10000	20000	200	8	14000	95:
	S04	41000		42000	18000	19000	33000	22000	S7000	95.	×	39000	4200
Indicator	ALK	314000		274000	224000	224000	238000	232000	250000	230000	8	242000	26000
parameter	HARD	348000		396000	260000	264000	212000	256000	294000	707	8	298000	33000
	SQI	443000		419000	269000	281000	319000	297000	376000	251	8	\$2,5000	37700
	pH(1)	8.2		7.5	 1.0	7.9	8.3	7.9	8.7	7	•	7.7	7.7
•	Ca Cond (2)	714		272) TT	127	895	433	670	ž	•	407	5

Notes and flagging codes are presented at the end of this table.

TABLE 11-6
SUMMARY OF GROUNDWATFR CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP
REMEDIAL. INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Type: WELL WELL WELL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL UGL	Site ID:		SW	-16-N	OHD		SWN-91	-05B	-NMS	91-0sc	-NWS	030-16
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		Sp.Cond.(2)	9		438		284	£	89 %	859	888	602

Notes and flagging codes are presented at the end of this table.

TABLE 11-6 SUMMARY OF GROUNDWATER CHEMICAL DATAOFF-POST AREA SOUTH OF BAAP REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
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ε	(3)	ner	VOC	SVOCs	Blank cell	•	GT	8	9	۵.	œ	S	H	×

USATHAMA chemical codes are defined in the RI Report Glossary

Appendix K contains complete analytical results

TABLE 11–7
SUMMARY OF GROUNDWATER CHEMICAL DATAPRIVATE WELLS
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

Sample Type: WELL	WELL 12/04/91 ONE 5.29 P - 31.4 23.8 23.8	7,6000	WELL UGL 12/04/91 ONE		WELL	
CH2CL2 5.88 CH2CL2 5.88 CHCL3 -			_			
CH2CL2 5.88 CHCL3 - AS - AS - BE 6.0 BE 0.338 CA 130000 CR - CO 6.31 FE - HG - AS - AS - AS - AS - AS - AS - AS - A				Zejeojeo CWT	12/04/91 ONF	76/60/40 C/ALL
CH2CL2 5.88 AS						
AS AS AS AS AS AS AS AS AS AS AS AS AS A	31.4 2.000 2.3.8 2.3.8	0.584 P	3.82 P	88.2	B 4.31 P	6.08 BB
AS BE CR CR CR CR CR MN MN MN MN MN MN MN MN MN MN MN MN MN	31.4 82000 23.8 	28.5 - 76000	1	4	ı	1
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BE CCA CCA HG MM MM MM NA NA NA NA NA NA NA NA NA NA NA NA NA	23.8	76000 -	*	86	31.9	33.3
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CR CC CC MN MN MN MN CC CC SO4	23.8	,	64000	72000	74000	74000
CU FE NA MAG SA SA SA SA SA SA SA SA SA SA SA SA SA	, 1000		28.6	,	19.6	ı
FE HG MAG MAN NA NA NA NA NA NA NA NA NA NA NA NA N	1200	7.66	,	,	1	4.63
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NIT SO4	180	178	224 X	320	167	117
S04	8000	8800	1800	,	9300	8100
S04	49000	51000	0056	0036	13000	13000
AIV	36000	35000	23000	23000	44000	42000
472	220000	270000	270000	286000	256000	302000
•	330000	360000	292000	306000	350000	3\$4000
4	444000	413000	336000	311000	412000	388000
	8.4	7.8	8.3	8.1	7.8	7.8
	92	746	432	\$20	516	059

Notes and flagging codes are presented at the end of this table.

TABLE 11-7 SUMMARY OF GROUNDWATER CHEMICAL DATAPRIVATE WELLS REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

Notes and flagging codes:

unitless	Specific conductivity, umhos/cm	Micrograms per liter (parts per billion)	Volatile organic compounds	Semi-volatile organic compounds	No analysis performed	Less than the Certified Reporting Limit (CRL)	Greater than the reported value	Analyte found in blank as well as sample	Reported results affected by interferences or high background	Results less than CRL, but greater than Criteria of Detection	Analyte required for reporting purposes, but not currently certified	Results based on internal standard	Uncertified analyte in a certified method	Analyte recovery outside of certified range, but within acceptable limits
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Ξ	3	ngr	VOC	SVOC	Blank cell		5	æ	g	۵.	~	S	_	×

USATHAMA chemical codes are defined in the RI Report Glossary

TABLE 11-8
CHEMICAL AND PHYSICAL PROPERTIES OF VOCS DETECTED IN GROUNDWATER
OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

CHEMICALS	CAS#	MOLECULAR WEIGHT (g/mole)	DENSITY (m/lg)	WATER SOLUBALTY (mg/l)	VAPOR PRESSURE (mmHg)	HENRY'S LAW CONSTANT (stm- m³/mole)	K., (ml/g)	K (ml/ml)
Volatile Organic Compounds								
CCL4	56-23-5	154	1.594	7.57×10 ²	06	2.41×10 ⁻²	110	437
CHCL3	67-66-3	119	1.483	8.2x10³	150.5	2.88×10 ⁻³	4	56
TACLE	79-01-6	132	1.45	1.1×10³	57.9	9.1×10 ⁻³	126	240

Notes:

A All data from the Risk Assessment Guidance for Superfund (USEPA, 1989a).

" K = partition coefficient between the organic chemical and carbon.

 c $K_{\mu\mu}$ = partition coefficient of the chemical between octanol and water.

See the List of USATHAMA Chemical Codes in the Glossary for definitions of chemical abbreviations.

TABLE 11-9 ESTIMATE OF DISTANCE TRAVELED BY CCL4 IN GROUNDWATER OFF-POST AREA SOUTH OF BAAP

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

$$V_c = V/[1+K_d(b/n)]$$
 $K_d = K_{oc}*f_{oc}$

Assume: Fraction of organic carbon $(f_{oc}) = 0.003$

Soil density (b) = 2 g/m² Soil porosity (n) = 0.3

A weighted-average groundwater flow velocity (V) along a flow line from the Propellant Burning Ground to the Wisconsin River:

V = (0.55)*(330 ft/yr) + (0.45)*(440 ft/yr) $\approx 440 ft/yr$

voc	CONTAMINANT VELOCITY V _v , (FT/YR.)	PARTITION COEFFICIENT K _d , (ml/g)	K _{oc} _	Years	DISTANCE TRAVELED (FT.)
CCL4	137.5	0.33	110	50	6.875

The approximate minimum distance that TRCLE has been transported in groundwater is 13,000 ft., in approximately 26 years. The velocity of TRCLE (V_c) in groundwater is:

 $V_c = 13,000 \text{ ft/26 yrs.}$

= 500 ft/yr (slightly greater than groundwater flow rate)

Assume CCL4 moves at rate of groundwater flow (440 ft/yr):

Estimated distance CCL4 has traveled = (440 ft/yr)*(50 yrs)

= 22,000 feet

or 4.2 miles

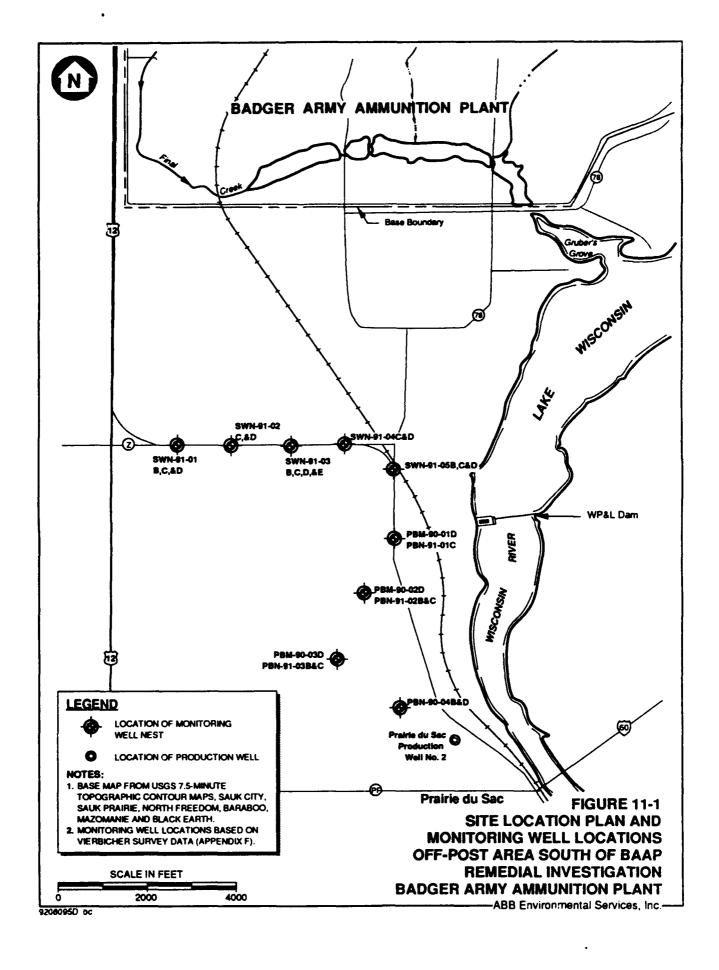
TABLE 11-10
COMPARISON OF GROUNDWATER TO STANDARDS UNITS: $\mu G/\ell$ OFF-POST AREA SOUTH OF BAAP

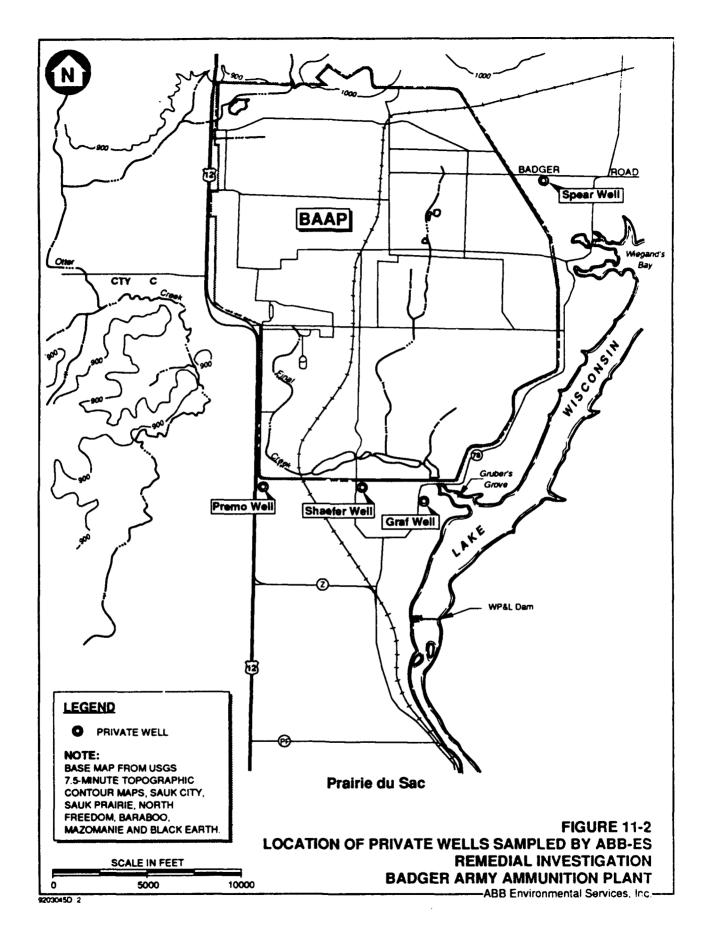
REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

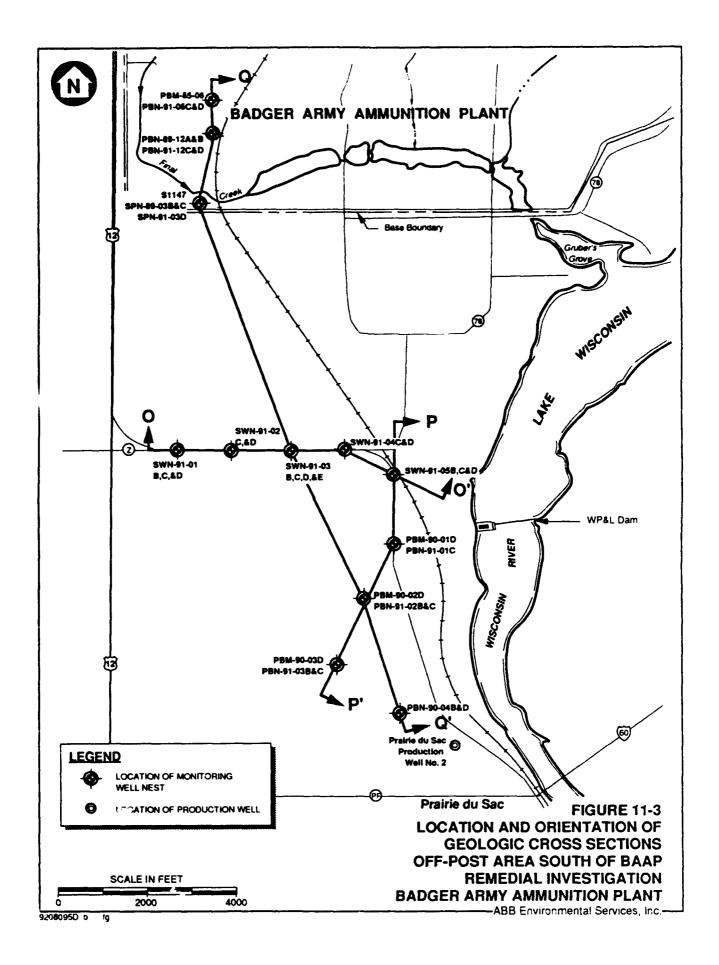
COMPOUNDS OF	FREQUENCY	MAXIMUM DETECTED	MINIMUM DETECTED CONCENTRATION	SDWA (1)	(Ξ)	WI GROU STANDA	WI GROUNDWATER STANDARDS (2)	CALCULATED
POTENTIAL CONCERN	DETECTION	CONCENTRATION		WCL	MCLG	ES	PAL	©
ВА	2:2	24.8	24.3	2,000	2,000	1,000(c)	200(c)	
CCL4	8:52	10.8	1.68	ß	0	'n	0.5	•
8	1.42	2.78	•	ß	ĸ	10(d)	1(d)	
CHCL3	6.52	1.31	0.433	•		ဖ	9.0	
ರ	42:42	49,000	3,100	250,000(a)		•	•	
క	16:42	14.5	4.61	100	100	50(e)	2(e)	•
MN	2:2	54.1	29.7	50(a)		50(f)	25(f)	
NA	2:2	27,000	25,000	20,000(b)	,	•		
N.	42:42	27,000	1,300	10,000	10,000	10,000	2,000	
82	1:42	5.6	•	F	0	50(g)	S(g)	•
SO4	42:42	64,000	18,000	250,000(a)	,	250,000(f)	125,000(f)	•
TRCLE	2:52	0.425	0.287	5	0	5	0.18	•

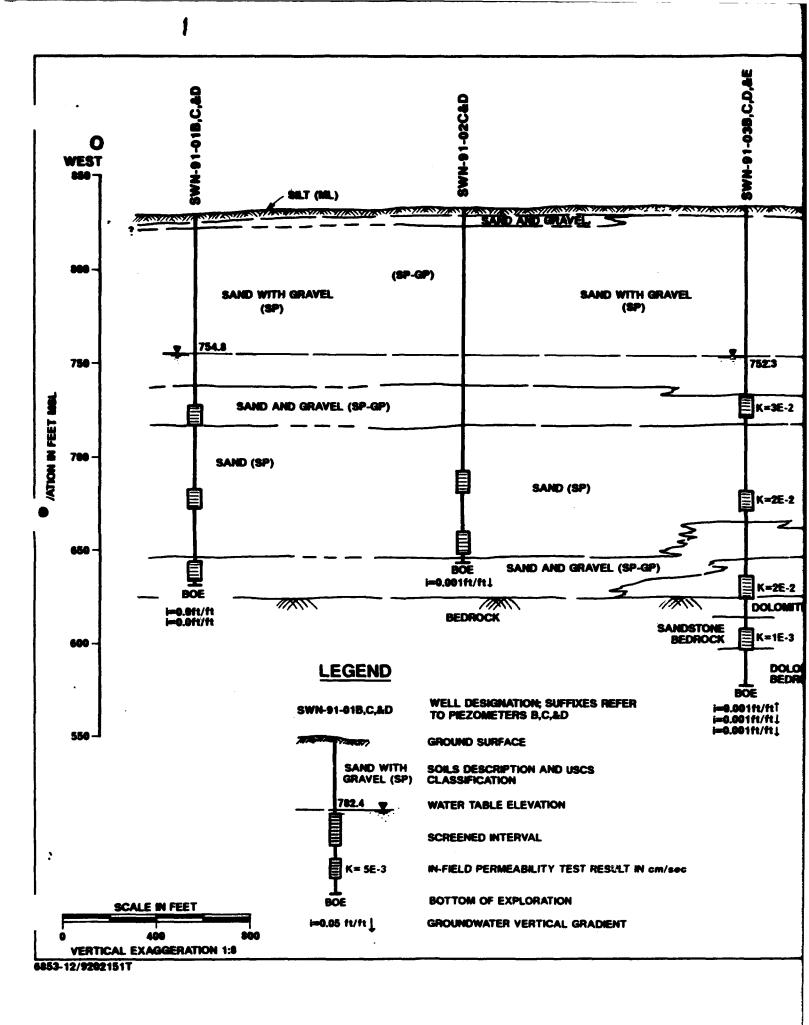
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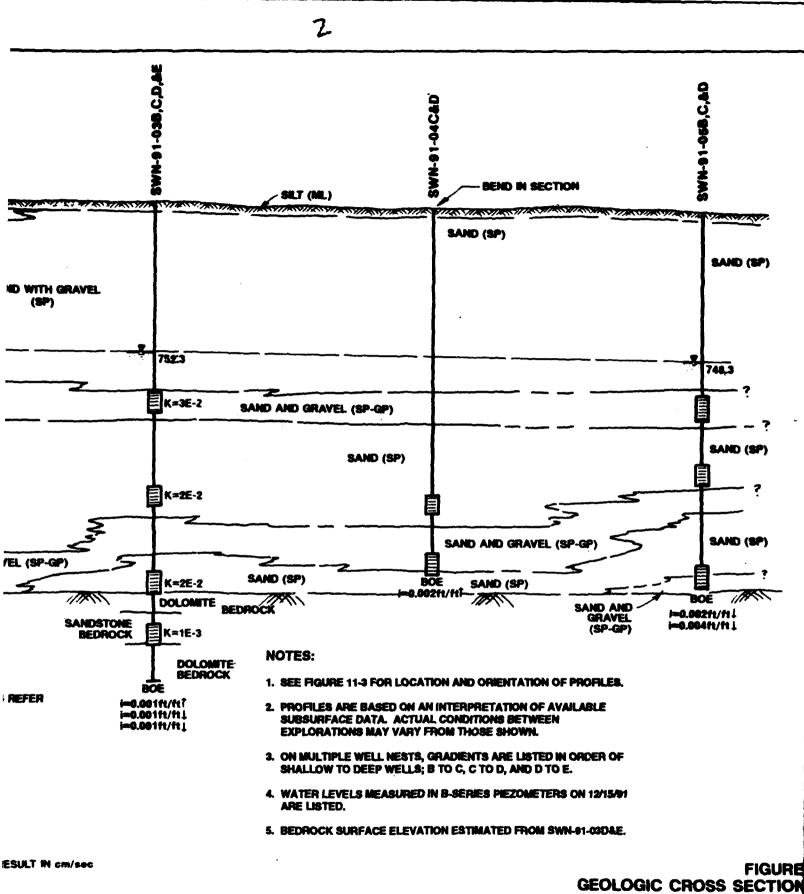
WI proposing change to ES = $2,000 \mu g/t$ and PAL = $400 \mu g/t$ WI proposing change to ES = $5 \mu g/t$ and PAL = $0.5 \mu g/t$ WI proposing change to ES = $100 \mu g/t$ and PAL = $10 \mu g/t$	than for protection of public health.	WI proposing change to ES = 15 μ g/ t and PAL = 1.5 μ g/ t .	≈ micrograms per liter	/A = Sate Drinking Water Act	. = Maximum Contaminant Level	H	= Wisconsin	= Enforcement Standard	= Preventive Action Limit	Treatment technique requirement in effect	Copper action level = 1,300 µg/t	Lead action level = 15 µg/t
€ € ©	3	<u>6</u>	₹	SDWA	∡	MCLG	₹	ES	PAL	F		
U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards." Office of Water, Washington, D.C., August 1991; EPA, 1991, "Fact Sheet: National Secondary Drinking Water Standards." Office of Washington D.C. Sendenher 1991, and EPA	1990, "National Primary and Secondary Drinking Water Regulations;	Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule,"	57FR31776, July 17, 1992 (see Subsection 3.6 for details).	Wisconsin Administrative Code, Chapter NR 140.10, Table 1 (see Subsection	3.6 for details).	Calculated to be protective at risk of 10 ⁶ or HI of 1 (see Subsection 4.5 for	details).	¥		Secondary drinking water standard, suggested level.	Reporting level. Monitoring is required and data is reported to health	officials to protect individuals on restricted sodium diet.
3				ũ		ල		Notes:		(g)	<u>Q</u>	







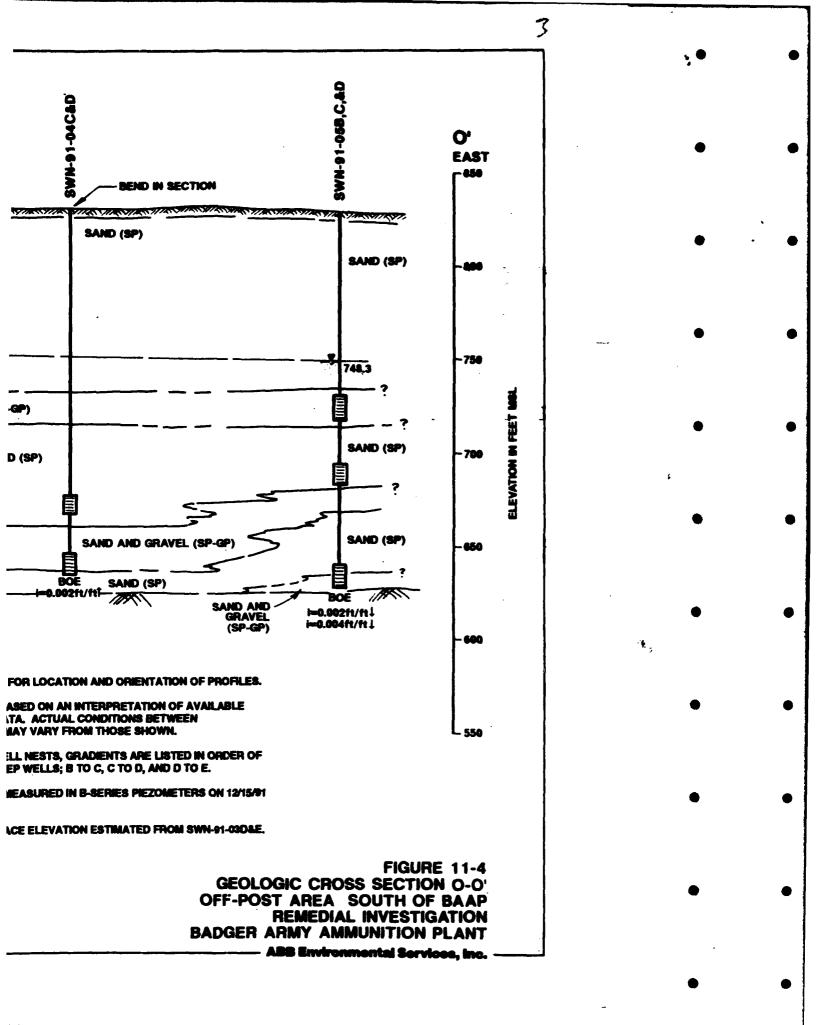


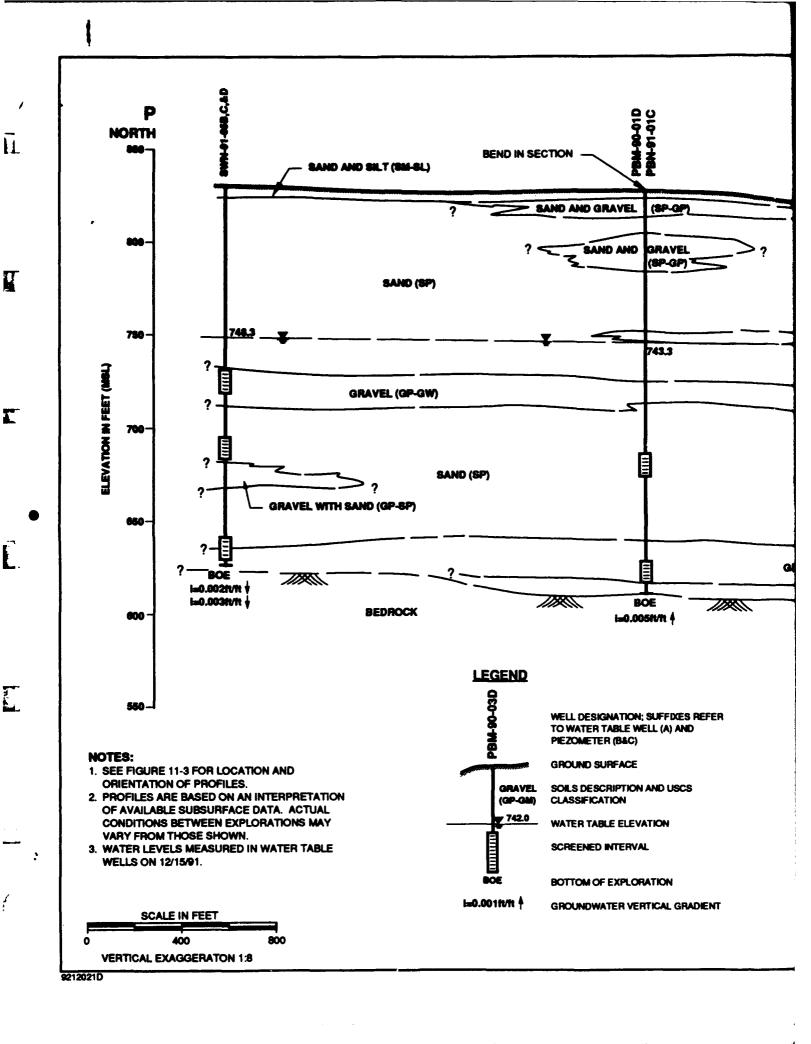


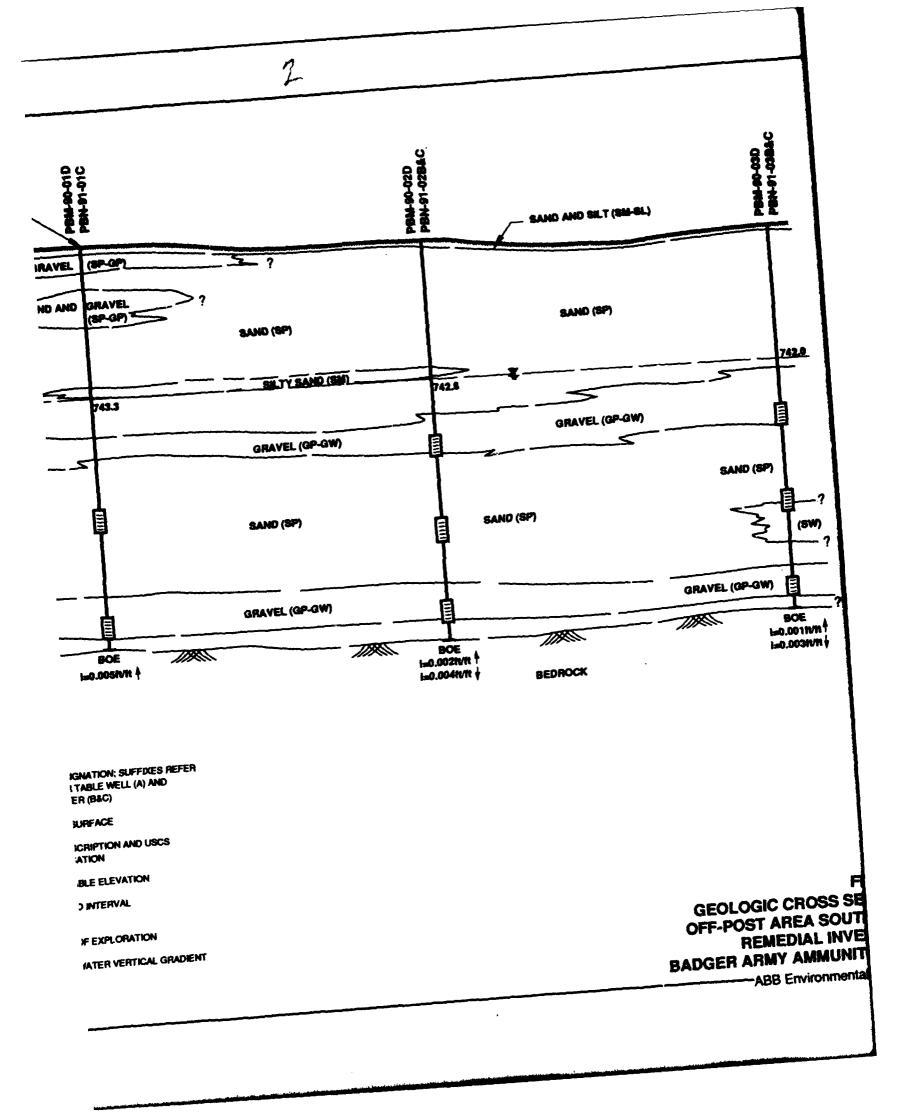
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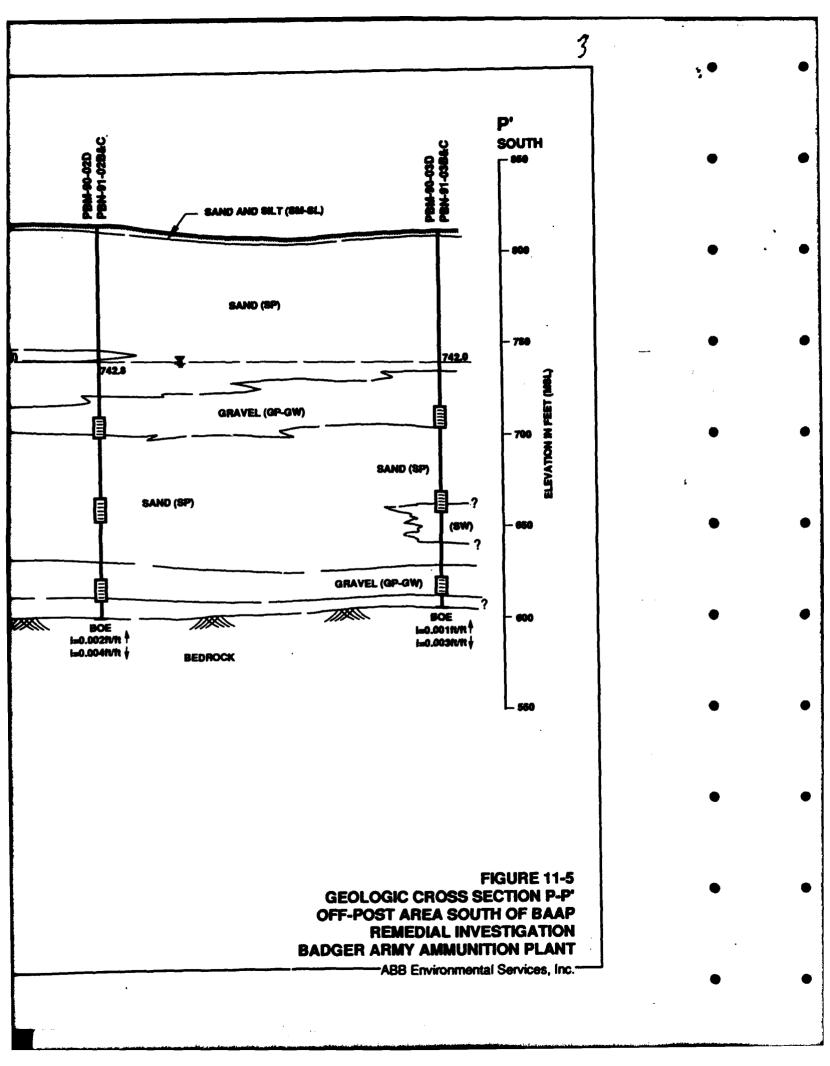
GEOLOGIC CROSS SECTION OFF-POST AREA SOUTH OF REMEDIAL INVESTIGATION PARTIES

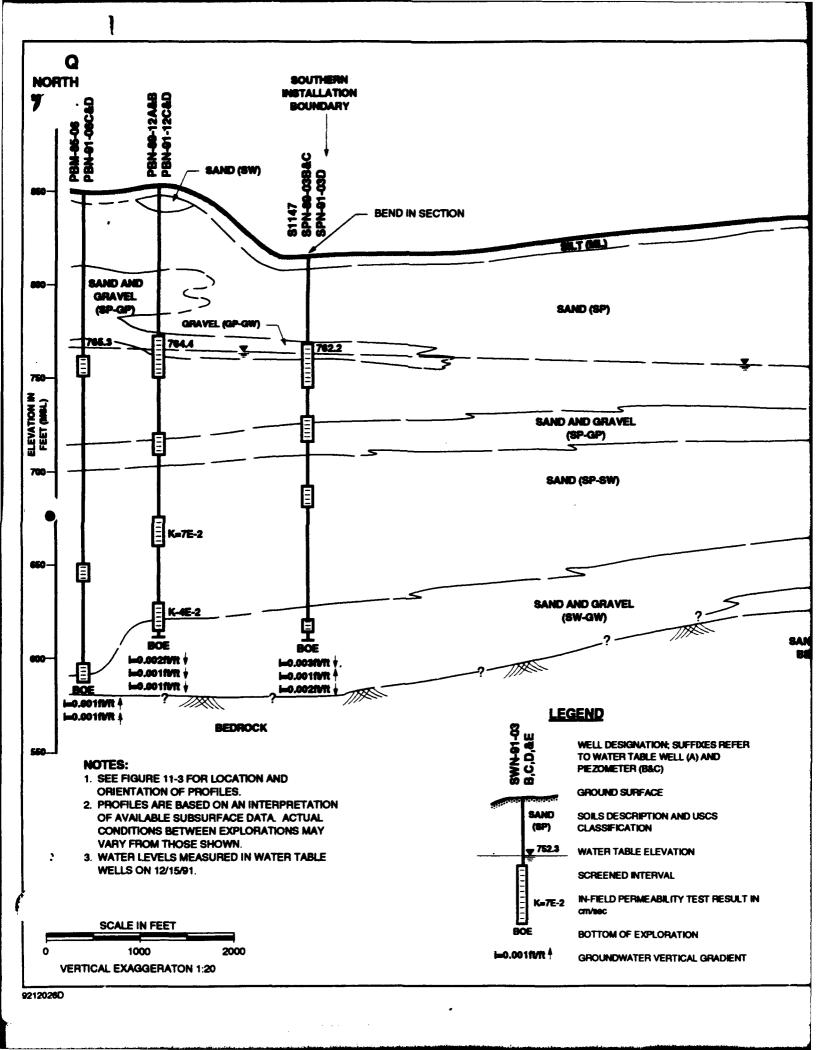
ABS Environmental Service

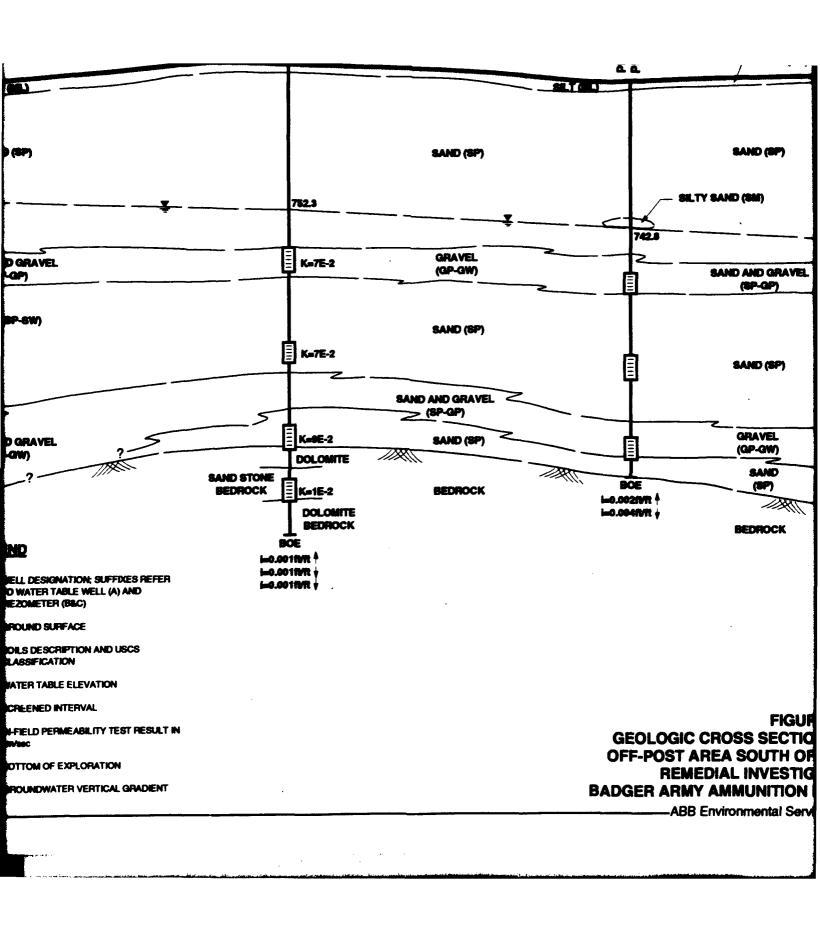


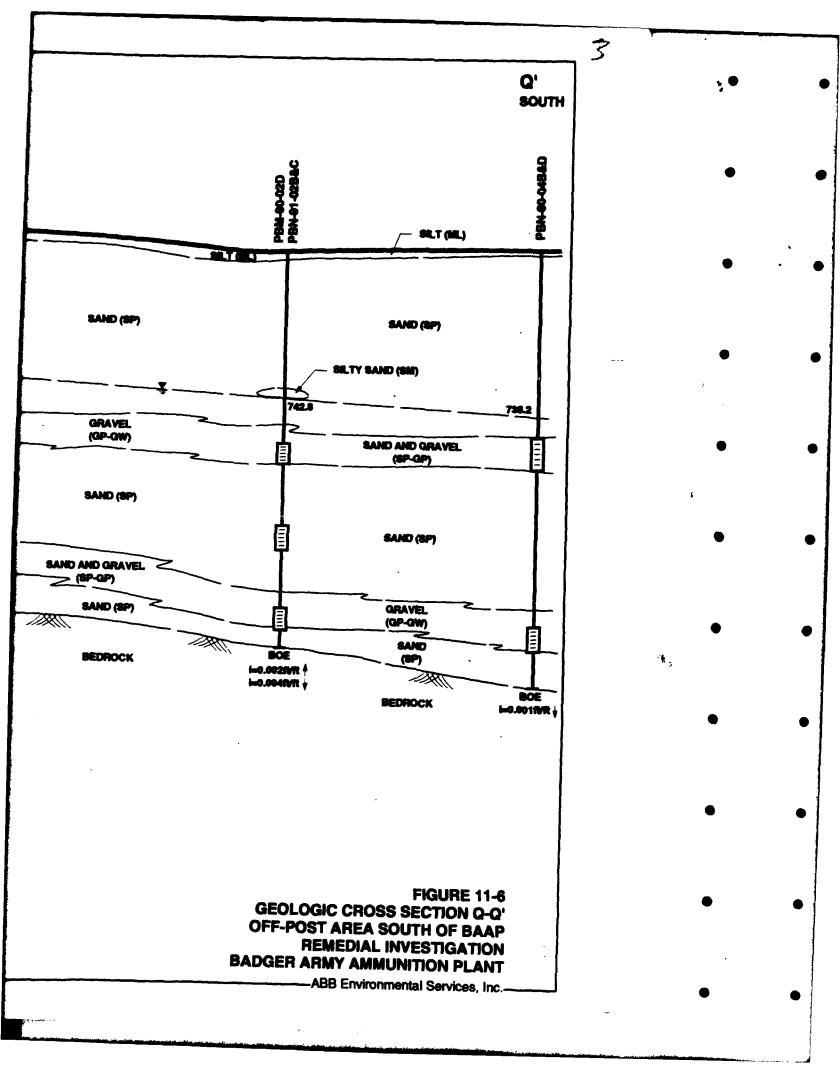


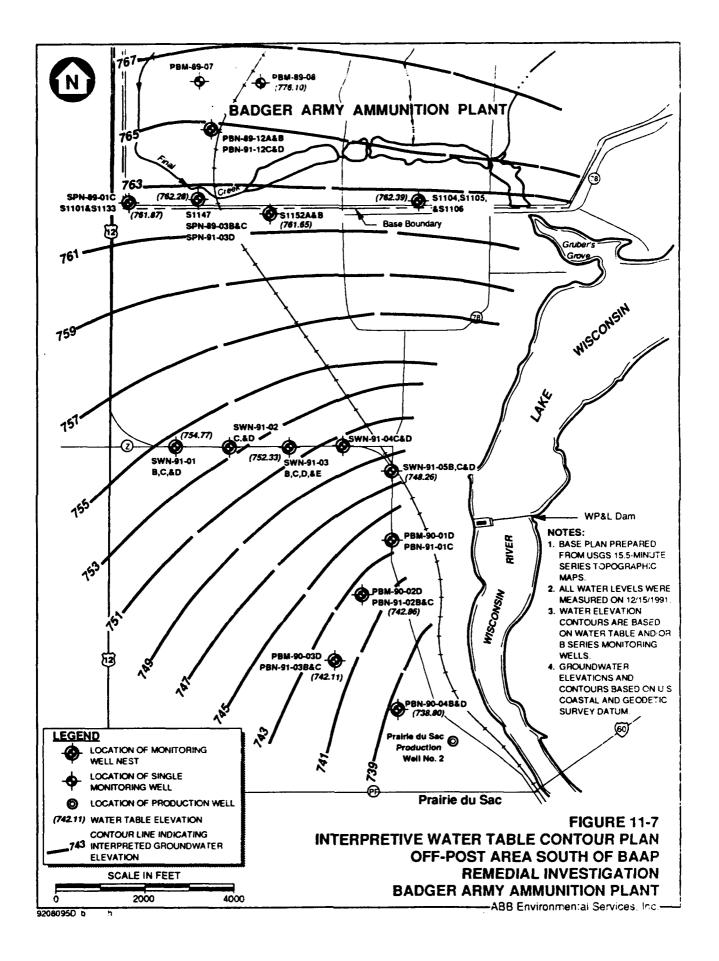


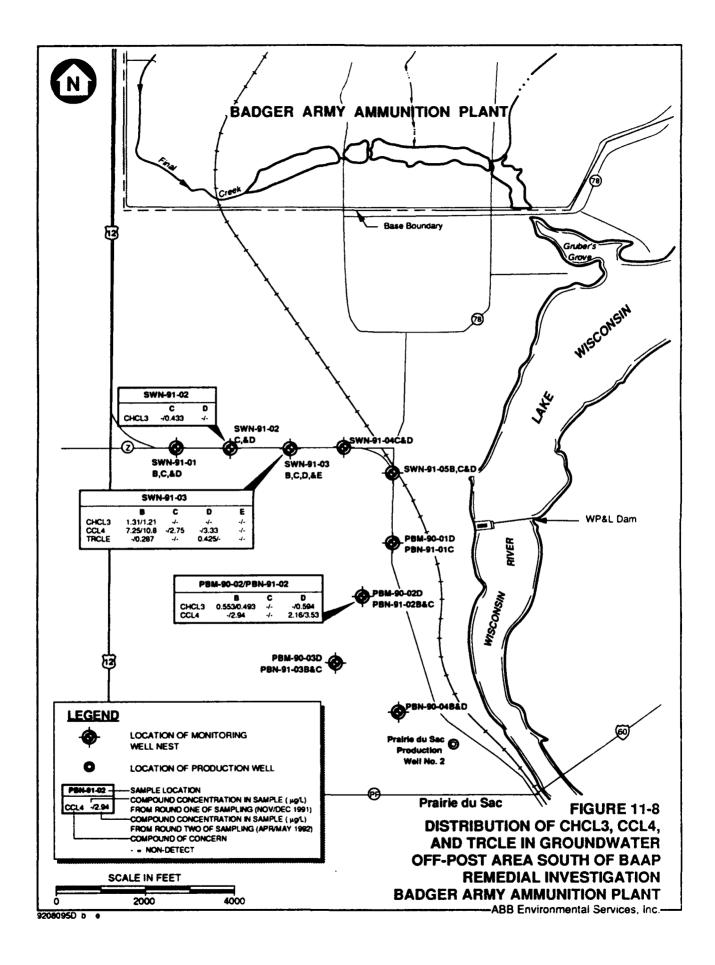










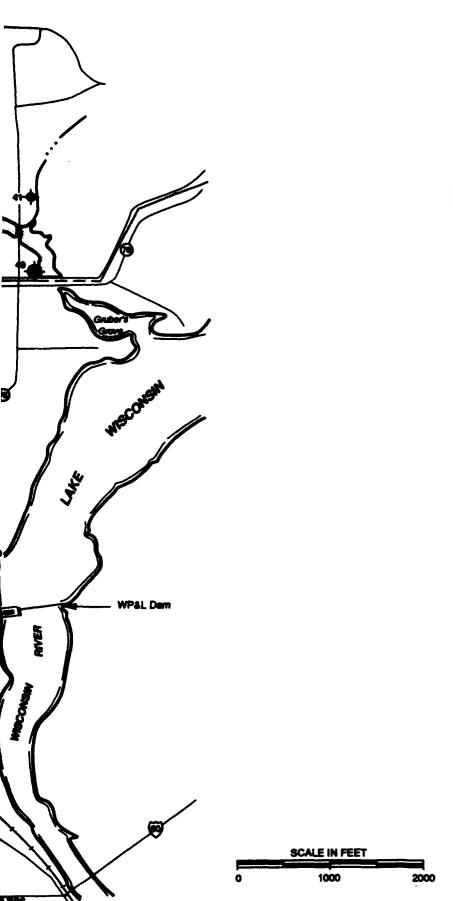


MAGAZINE AREA BADGER ARMY AMMUNITION PLANT SETTLING PONDS AND SPOILS DISPOSAL AREA Base Boundary CAD SWN-01-04CED **②** SWN-01-01 SWN-61-03 8,C,D,AR B,C,AD WP&L Dam RIVER PBN-91-01C PBM-90-03D PBN-91-03B&C ,PBN-90-04B&D **69** Prairie du Sac Production Well No. 2 **⊕** Prairie du Sac 9212022D123

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CODE	WELL NUMBER	CODE	WELL NUMBER	CODE	WELL NUMBER
	PBN-69-10A,B,C,&D	24	PBM-86-02	35	SPN-00-03A,B,A6
10	81144	25	PEN-49-49BAC		SPN-01-02D
12	PBM-82-03		PBN-85-09A	35	SPN-49-03BAC
13	PBM-82-04	26	PBM-00-05	-	SPN-01-03D
14	PBM-02-05	27	PBM-05-04	1	81147
15	PBN-62-05A,B,&C	28	PBM-05-05	37	SPN-89-04B&C
16	81117	29	PBM-00-06	1	81146, SPN-01-4
17	PBN-82-03A.B.&C	30	PON-SO-04BAC	38	\$1102, \$1103, \$
	\$1146		PBN-85-04A	39	SIISSAAR
18	PBN-62-04A.B.&C	31	PBM-00-07	40	SPN-00-05ALE
19	PBM-05-01	32	PEN-01-00C&D	41	81110
20	PBM-89-06		PBM-05-06	42	\$1104, \$1105, \$1
21	PBN-89-0284C	33	PRN-00-12AAB	43	\$1100
	PBN-85-02A		PBN-01-12CAD	1 44	S1115, S1116
22	PB04-05-03	94	8PN-69-01C	1 -	
22	PBN-69-01B,C,&D PBN-65-01A		81101 & 81133		

LEGEND





LOCATION OF PRODUCTION WELL



INTERPRETIVE EXTENT OF VOC PLUME

NOTE:

- EXTENT OF VOC PLUME IS BASED ON DETECTION OF CHICLS, CCL4 AND TRICLE IN AT LEAST ONE ROUND OF SAMPLING.
- 2. SEE FIGURES 6-33 AND 6-34 FOR INTERPRETIVE PLAN VIEW OF PROPELLANT BURNING GROUND LANDFILL 1, SETTLING PONDS AND SPOILS DISPOBAL AREA VOC PLUMES.
- 3. MONITORING WELL LOCATIONS BASED ON VIERBICHER SURVEY DATA (APPENDIX F).

INTERPRETIVE PLAN VIEW OF PROPELLANT BURNIN SETTLING PONDS, SPOILS DISP AND OFF-POST AREA SOUT REMEDIAL INVIBADGER ARMY AMMUNITABLE Environment

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MAP	WELL NUMBER	MAP CODE	WELL NUMBER	CODE	WELL NUMBER
	PBN-89-10A,B,C,&D	24	PBM-85-02	36	SPN-89-02A,B,&C
10	\$1144	25	PBN-89-03B&C	1	SPN-91-02D
12	PBM-82-03		PBN-85-03A	36	SPN-69-03B&C
13	PBM-82-04	26	PBM-89-05		SPN-01-03D
14	PBM-82-05	27	PBM-85-04	1	S1147
15	PBN-82-05A,B,&C	28	PBM-05-05	37	SPN-89-04B&C
16	\$1117	29	PBM-89-08	1 -	S1148, SPN-91-04D
17	PBN-82-03A.B.&C	30	PBN-89-04B&C	36	\$1102, \$1103, \$1149
••	\$1146		PBN-05-04A	39	S1152A&B
18	PBN-82-04A,B,&C	31	PBM-80-07	40	SPN-89-05AAB
19	PBM-85-01	32	PBN-01-06C&D	41	S1110
20	PBM-89-06		PBM-85-06	42	S1104, S1105, S1106
21	PBN-89-0284C	33	PBN-89-12A&B	43	\$1109
	PBN-85-02A		PBN-01-12C&D	44	S1115, S1116
22	PBM-85-03	34	SPN-89-01C	1 "	
22 23	PBN-89-01B,C,&D	, 	S1101 & S1133	ľ	
	PBN-85-01A		JJ. J. J	i	

LEGEND



LOCATION OF MONITORING WELL NEST



LOCATION OF SINGLE MONITORING WELL



LOCATION OF PRODUCTION WELL



INTERPRETIVE EXTENT OF VOC PLUME

NOTE:

- EXTENT OF VOC PLUME IS BASED ON DETECTION OF CHCL3, CCL4 AND TRCLE IN AT LEAST ONE ROUND OF SAMPLING.
- SEE FIGURES 6-33 AND 6-34 FOR INTERPRETIVE PLAN VIEW OF PROPELLANT BURNING GROUND, LANDFILL 1, SETTLING PONDS AND SPOILS DISPOSAL AREA VOC PLUMES.
- 3. MONITORING WELL LOCATIONS BASED ON VIERBICHER SURVEY DATA (APPENDIX F).

FIGURE 11-9
INTERPRETIVE PLAN VIEW OF VOC PLUME
PROPELLANT BURNING GROUND,
SETTLING PONDS, SPOILS DISPOSAL AREA
AND OFF-POST AREA SOUTH OF BAAP
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

ABB Environmental Services, Inc.

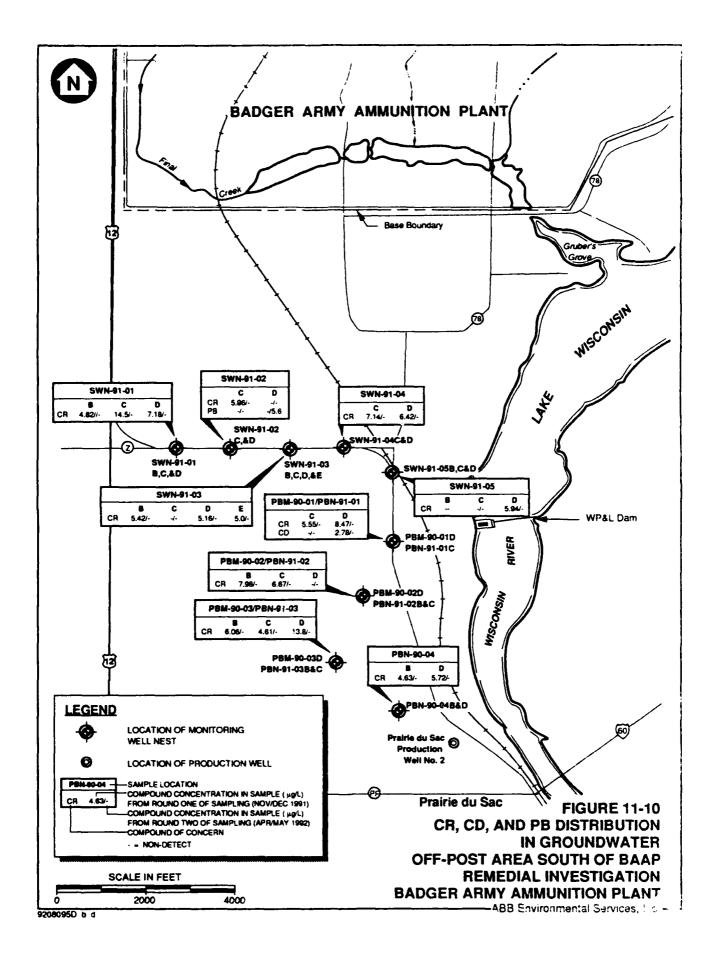


TABLE 12-1

SUMMARY OF AREAS FOR WHICH REMEDIAL ACTION OBJECTIVES¹ ARE RECOMMENDED

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

AREA	MEDIUM (RECEPTOR)	COMPOUNDS
Propellant Burning Ground	Surface Soil (Human)	РВ
	Surface Soil (Ecological)	PB ² , CU ² , HG ² , SE ² , ZN ²
	Subsurface Soil (Human)	PB, 24DNT
Final Creek	Surface Soil (Ecological)	PB ² , SN, 24DNT, SO4, DPA
Settling Pond 1	Surface Soil (Ecological)	PB ² , SN, 24DNT, SO4, DEP
Settling Pond 2	Surface Soil (Ecological)	PB ² , SN, DEP
Settling Pond 3	Surface Soil (Ecological)	PB ² , SN
Settling Pond 4	Surface Soil (Ecological)	PB ² , SN, AL ²
Spoils Disposal Area 1	Surface soil (Ecological)	PB ² , DPA, SN, NG, ZN ²
Spoils Disposal Area 2	Surface Soil (Ecological)	PB ² , SN, ZN ²
Spoils Disposal Area 3	Surface Soil (Ecological)	PB ² , SN, ZN ²
Spoils Disposal Area 4	Surface Soil (Ecological)	PB ² , SN ² , ZN ²
Spoils Disposal Area 5	Surface Soil (Ecological)	PB ² , SN ² , ZN ²
Propellant Burning Ground/Settling Ponds	Groundwater (Human)	26DNT, CHCL3, BE, CCL4. TRCLE, NNDPA
Deterrent Burning Ground	Subsurface Soil (Human)	24DNT
Deterrent Burning Ground/Existing Landfill	Groundwater (Human)	26DNT, BE, 112TCE

TABLE 12-1

SUMMARY OF AREAS FOR WHICH REMEDIAL ACTION OBJECTIVES' ARE RECOMMENDED

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

AREA	MEDIUM (RECEPTOR)	Compounds
Nitroglycerine Pond	Surface Soil (Human)	РВ
	Surface Soil (Ecological)	PB ² , HG ² , NG
	Sediment (Ecological)	PB, HG
	Surface Water (Ecological)	AL, FE, HG, MN, PB
Rocket Paste Area	Surface Soil (Human)	PB,NG
	Surface Soil (Ecological)	24DNT, 26DNT, NNDPA, PB ² , CR ² , HG ² , NG
	Sediment (Ecological)	РВ
	Surface Water (Ecological)	AL, CR, CU, FE, MN, PB, ZN
Off-Post Wells South of BAAP	Groundwater (Human)	CCL4

Notes:

The aim of the Remedial Action Objective should be to reduce contact with or concentrations of the compounds listed for a specific media at a site.

² Compounds whose risk-based PRGs are within naturally-occurring mean surface soil background concentrations.